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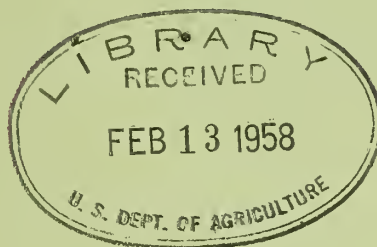
UNITED STATES DEPARTMENT OF AGRICULTURE
U.S. FOREST SERVICE

U.S. Forest Service

ALL-REGIONS COMMUNICATIONS CONFERENCE,

Portland, Oregon,

January 19-23, 1948



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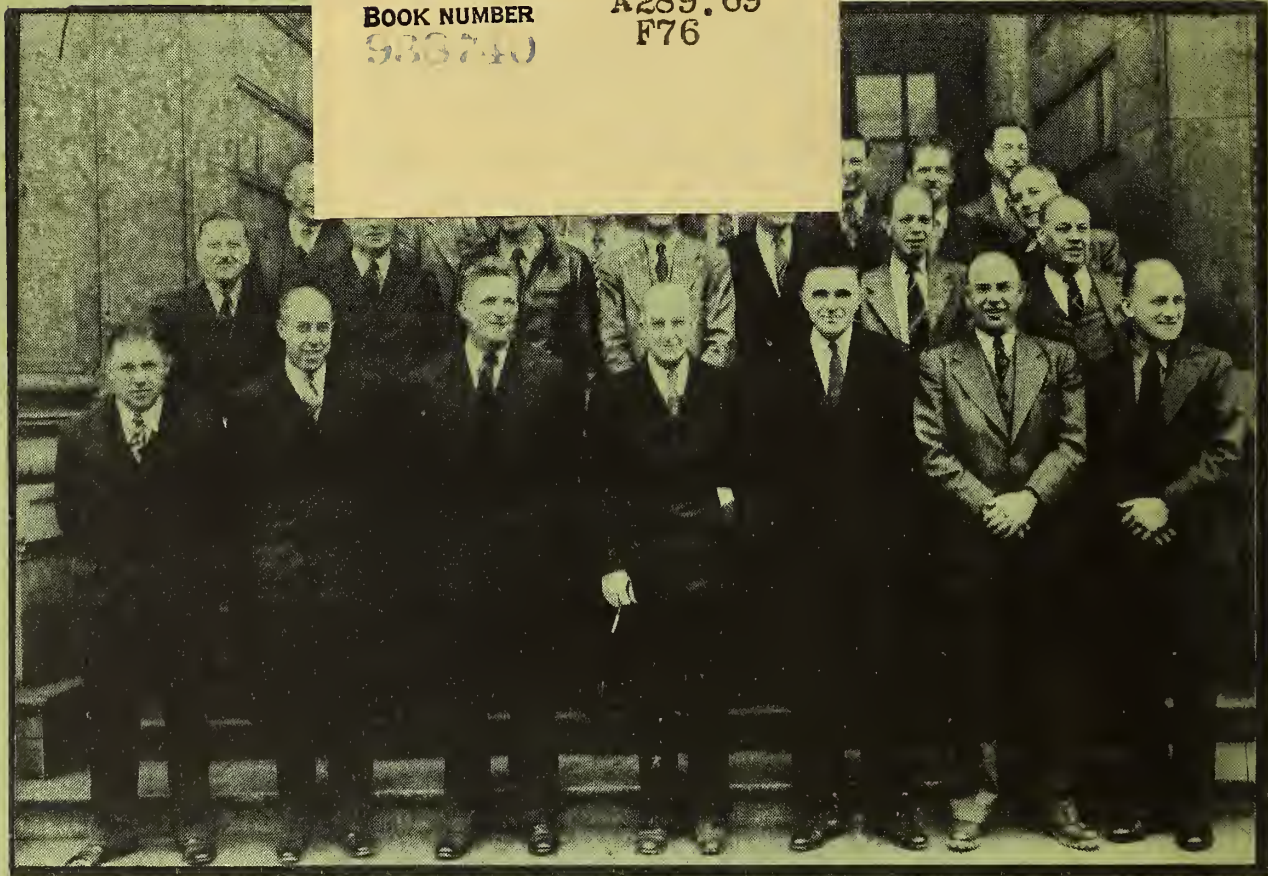
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FRONT ROW, left to right: Fred Biggerstaff (R-6); David S. Nordwall (W.O.); George Duvendack (W.O.); F. V. Horton (R-6); Harold K. Lawson (R-6); Mayhew H. Davis (R-9); Larry K. Mays (R-6). SECOND ROW: Norman F. Johnstone (R-9); Herbert T. Holmquist (W.O.); Arthur L. Turner (R-2); Richard H. Lewis (R-3); Bernard A. Anderson (R-4); Guy V. Wood (R-5); Thomas H. Burgess (R-6). BACK ROW: William S. Williams (R-5); R. M. Conarro (R-8); James C. Iler (R-1); Allan E. Loew (R-6); W. B. Apgar (R-1); Francis W. Woods (R-4); G. A. Knight (R-8); Harvey O. Robe (R-2); E. M. Karger (R-7).

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICEAddress Reply to
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and Refer to

WASHINGTON 25, D. C.

O
SUPERVISION
Meetings (Communications)

November 6, 1947

O. No. 693

Reply Due December 1

Regional Forester
All Regions

Dear Sir:

The last Service-wide meeting of communication officers was held in Portland in 1940. Planned periodic meetings since then have been disrupted by the war and the subsequent rush to get back on a peace-time basis.

There have been numerous developments since 1940 which have created new problems in our field of communication. The rapid expansion of power line construction by REA and private utility companies has created problems of telephone line reconstruction or abandonment and in some instances the substitution of radio for telephone communication. The telephone companies' conversion to dial systems has created many problems and will be even more troublesome in the next ten years. Radio itself has advanced by leaps and bounds in performance during the past five years. Some of our practices must be reconsidered in the light of present-day use of radio.

There is an acute need for a meeting of minds and a united approach on many of our problems and procedures, not only among our communication technicians but more importantly among responsible administrative officers. We feel that this need can best be met through a joint meeting of technical and administrative people this winter. The following represents a few of the problems or topics which seem to warrant special attention:

1. A study of our frequency and power allocations. IRAC should be able to tell us within a very short period just what changes the recent International Telecommunications Conference made in the frequency field.
2. Discussion and demonstration of new and recently-developed radio equipment at the Laboratory.
3. Future trends in specialized high-frequency radio development and use by commercial interests, discussed by a representative or two from one or two of the larger radio manufacturing companies.

2-Regional Forester-All Regions-November 6, 1947

4. Management responsibilities in the Forest Service communication field; (a) the Chief's Office, (b) the Radio Laboratory, and (c) Regional and Forest administrative officers and technicians. (Management includes such items as planning, organization, supervision, inspection, training, etc.)
5. Cooperative relationships and how best serve States and other outside agencies by (a) Chief's Office, (b) Laboratory, and (c) Regional administrators and technicians.
6. The Laboratory program and service to Forest Service programs. The development schedule - need for modification.
7. Determination of what is needed in the way of supplements to the new Telephone Handbook - committee to study and report.
8. Determination of what we require in the way of a Radio Section in the Communications Handbook - committee to study and report.
9. Safety in the communications field.
10. Procedure to be used in the selection of communication technical personnel and in making their efficiency ratings.
11. The need for equipment standardization.

The above topics are not all-inclusive. They are cited merely to start you thinking on what should be covered in the proposed meeting. The plan is to hold the meeting in Portland, starting on Monday, January 19, 1948. A full-week conference is contemplated. In preparation for such a meeting, please submit a list of topics you wish to have discussed, listed in order of priority. In order to assure full consideration and coordination, please have these suggestions reviewed by your Divisions of Operation, Fire Control, Engineering, and State and Private Forestry. When submitting these suggestions, we should also like to have your recommendations for participation. Having in mind that administrative judgments are desired, it occurs to us that the "larger" Regions will wish to send a technician and an administrative officer; in the other Regions, representation by the responsible administrative officer or technician should be adequate. It is important in this connection that the number attending be limited sufficiently to permit maximum results.

May we have your reply by December 1?

Very truly yours,

LYLE F. WATTS, Chief

By

R. E. Marsh

UNITED STATES DEPARTMENT OF AGRICULTURE
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and Refer to

WASHINGTON 25, D. C.

O
SUPERVISION
Meetings
Communications

December 12, 1947

Regional Forester
All Regions

Dear Sir:

Enclosed is the agenda for the Communications Conference scheduled in Portland the week of January 19-23, 1948. Also, enclosed are the principal questions or problems, submitted by the Regions, which pertain to the topic or topics your representative will present at the Conference.

The agenda gives the individual assignment responsibilities and committee memberships. While as many as possible of the topics submitted by the Regions were included in the agenda, the limited time allotted to the Conference will not permit the inclusion of all. Those topics or problems not included, but which have a bearing on one of the agenda topics, are, however, being made available to the respective topic chairmen. Accordingly, practically all of your suggestions as to the Conference subject matter will receive consideration.

The conduct of the meeting is so designed that a minimum of time is allowed to adequately present a topic. Floor discussion time also is restricted in order that as much time as possible can be used for committee work sessions. The committee reports and recommendations, coupled with their acceptance by the Conference or the registration of specific objections, will be used here in setting policy, establishing standards and guide lines in planning, organizing, and managing the Forest Service communication enterprise.

The staff of the Laboratory will be available Monday and Tuesday, January 26-27, to assist technicians who desire to remain after adjournment of the regular meeting to attend to unfinished regional business.

Region 6 will make hotel reservations for the "outside" group attending the Conference. Anyone desiring to make his own arrangements should so notify Region 6 before December 30. Reservations will be made for Sunday, January 18, and Region 6 will notify those attending of the hotel at which they are to register.

Very truly yours,

WM. P. KRAMER, Chief
Division of Operation

Encs.

By

A handwritten signature in dark ink, appearing to read "J. S. Redwall".

FOREST SERVICE COMMUNICATIONS CONFERENCE

Place: Portland, Oregon
 Time: January 19 through 23, 1948
 Attendance List: See page No. 6

Conference Chairman - D. S. Nordwall, Alternate Chief
 Division of Operation, Washington, D. C.

Committee Coordinator
 and Consultant - George H. Duvendack, Communications Officer
 Division of Operation, Washington, D. C.

Time	Topic	By
Mon., 19		
8:00	Opening	Nordwall
	Welcome	Regional Forester H. J. Andrews
8:30	<u>TOPIC NO. 1.</u>	
	Management's Job and Responsibilities.	Horton - a paper
	a. Need for policy formulation or revision - emphasis on integration of radio nets and telephone systems.	
	b. Establishment of standards and guides for use in organization, supervision, training and inspection.	
	c. The Radio Laboratory's place in the Communi- cation Program. Technical and administrative relationships with Chief's Office, Regions, and other units.	
	Committee: <u>Horton, Chairman; Karger, Conarro,</u> <u>Davis, Anderson.</u>	
9:00	Floor discussion	
9:45	Recess	

Time	Topic	By
10:00	<u>TOPIC NO. 2</u>	
	Establishment of standards and guides for use in preparing communication plans. What should the plan contain? What basic elements should be considered? What format should it take for the Regional plan? The Forest plan?	Anderson - a paper
	Committee: <u>Anderson, Chairman; Robe, Loew, Lewis, Williams.</u>	
10:15	Floor discussion	
10:45	<u>TOPIC NO. 3</u>	
	A Study of Frequency and Power Allocations.	Duvendack - a paper
	Committee: <u>Duvendack, Chairman; Lawson, Apgar, (Guy) Wood.</u>	
11:00	Floor discussion	
11:30	Lunch	
1:00	<u>TOPIC NO. 4</u>	
	Inter-Agency Equipment Standardization as Related to National Security.	Walter H. Campbell - Com. Eng., Engineering & Technical Br., Chief Signal Officer, Signal Corps, US Army A talk.
1:30	Questions and discussion	
2:00	<u>TOPIC NO. 5</u>	
	What is needed in the way of:	
	a. Radio Section of Communications Handbook;	
	b. Standard Operating Instructions;	
	c. Standard Nomenclature List.	Knight - a paper
	Committee: <u>Knight, Chairman; Turner, Johnstone, Lewis.</u>	
2:30	Floor discussion	
3:00	Committee work sessions	
5:00	Adjourn	

Time	Topic	By
Tues., 20		
8:00	<u>TOPIC NO. 6</u>	
	Forest Service Problems of Equipment Standardization, including Airdraft Radio.	Lawson - a paper
	Committee: <u>Lawson, Chairman</u> ; Davis, Robe, Anderson, (Francis) Woods.	
8:30	Floor discussion	
10:00	Recess	
10:15	<u>TOPIC NO. 7</u>	
	Communications Financing, including Personnel, Equipment Purchases, Construction and Maintenance of Plant.	Iler - a paper
10:45	Radio Maintenance by Forest Service Technicians.	(Guy) Wood - a paper
11:15	Opportunities for Contracting Radio Maintenance Work.	Karger - a paper
	Committee: <u>Iler, Chairman</u> ; (Guy) Wood, Karger.	
11:45	Lunch	
12:45	Floor discussion	
2:00	<u>TOPIC NO. 8</u>	
	Safety Measures to be Employed in the Forest Service Field of Communications.	Apgar - a paper
	Committee: <u>Apgar, Chairman</u> ; Turner, Johnstone, Knight, Region 6 Safety Officer.	
2:30	Floor discussion	
3:00	Committee work sessions	
5:00	Adjourn	
Wed., 21		
8:00 to 5:00	<u>FIELD DAY</u>	
	Demonstration of F.M. Laboratory-Designed Equipment.	Lawson, Biggerstaff

Discussion of results of demonstration will be incorporated in Committee Report, Topic No. 1

Time	Topic	By
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Thurs., 22

8:00

TOPIC NO. 9

Problems relating to Recruitment, Selection, Conarro - a paper
Classification and Rating of Technical Personnel.

Committee: Conarro, Chairman; Iler, Lawson,
a member of R-6 Personnel Office
will serve in an advisory capacity
to the Committee.

8:30

Floor discussion

9:30

TOPIC NO. 10

How to Meet the Problems Confronting the Williams - a paper
Forest Service in Maintaining a Properly
Balanced Telephone System:

- a. Standards of maintenance in relation to Williams
available funds.
- b. Impact of power line construction. Williams
- c. Impact of dial conversions. Williams
- d. Opportunities for relinquishing F.S.
lines which are commercial in character. Williams

10:00

Recess

10:15

- e. Possible Forest Service use of Rural
Power Line Carrier System; Joint Use
of Rural Power Lines.

Loew or a repre-
sentative of Pacific
Tel. & Tel. Company

Committee: Williams, Chairman; Loew,
Holmquist, Biggerstaff,
(Francis) Woods

10:45

Floor discussion

11:30

Lunch

12:30

TOPIC NO. 11

Cooperative Relationships and How to Best
Serve the States' Divisions of Forestry and
Other Protection Agencies in the Communications
Field by:

Karger - a paper

Time	Topic	By
	a. Chief's Office	
	b. Laboratory	
	c. Regional administrators and technicians.	
	Committee: <u>Karger, Chairman</u> ; Burgess, Lawson <u>Duvendack.</u>	
1:00	Floor discussion	
2:00	Committee work sessions	
	Committees will complete their work and have their written recommendations in final form for presentation to the conference Friday morning.	
Fri., 23	Committee Reports. Brief floor discussion followed by Conference Acceptance, Rejection, or Modification. Conference reports to be submitted to Conference chairman for review by the Chief's staff.	
8:00	Topic No. 1 and Topic No. 2	Horton Anderson
9:15	Topic No. 3	Duvendack
10:00	Recess	
10:15	Topic No. 5 (Topic No. 4-Talk by Mr. Campbell)	Knight
11:00	Topic No. 6	Lawson
12:00	Lunch	
1:00	Topic No. 7	Iler
2:00	Topic No. 8	Apgar
3:00	Topic No. 9	Conarro
4:00	Topic No. 10	Williams
5:00	Topic No. 11	Karger
6:00	Meeting adjourns	

Regional Technicians may desire to remain over the weekend and to discuss regional technical problems at the Laboratory, starting Monday, January 26.

LIST OF PERSONNEL AND COMMITTEE ASSIGNMENTS SCHEDULE

		Committees and Topic Numbers										
Region	Name	1	2	3	4	5	6	7	8	9	10	11
1	Iler, James C. Apgar, Wm. B.			X				Chr	Chr	X		
2	Robe, Harvey O. Turner, Arthur L.		X			X	X		X			
3	Lewis, Richard H.		X			X						
4	Anderson, Bernard A. Woods, Francis W.	X	Chr				X X				X	
5	Williams, Wm. S. Wood, Guy V.		X	X				X			Chr	
6	Horton, F. V. Lawson, Harold K. Loew, Allan E. Biggerstaff, W. F. Burgess, Thomas, H., S&P Reps. from Div. of Personnel	Chr		X			Chr			X		X
			X								X X	X
									X	X		X
7	Karger, E. M.	X						X				Chr
8	Conarro, R. M. Knight, G. A.	X				Chr			X	Chr		
9	Davis, Mayhew H. Johnstone, Norman F.	X				X	X		X			
10	None											
W.O.	Nordwall, David S. Holmquist, Herbert Duvendack, G. H.			Chr							X	X
War Dept.	Campbell, Walter H. (Topic No. 4)											
Com. Field	Representative of Pacific Tel. & Tel. Co. (Topic No. 10 e)											

OPENING REMARKS

By D. S. Nordwall

The last all-Service Communications Conference was held here in Portland in 1940. The 1940 meeting was attended largely by communications officers with a few administrative officers--principally fire control--in attendance. The meeting was designed and devoted almost entirely to radio and related equipment problems of a technical nature. Unfortunately the war prevented the attainment of many of the objectives set up in the 1940 meeting.

Many of the fundamental problems which concerned the group in 1940 are still with us today; others have been resolved; new ones confront us. Our concept of the future of the communications enterprise in the Forest Service has assumed a somewhat different complexion with the recent FM developments. Our entire Radio Laboratory program has been realigned to concentrate on FM gear. In making this very important decision, we were guided by our technical experts at the Laboratory, the definite national and international trend toward use of higher frequencies, and the collective opinions from you folks in the Regions.

As I mentioned before, the 1940 meeting was concerned mainly with the technical problems of Telephone and Radio communications. The administrative problems are equally perplexing and frequently even more significant on a long-range basis. I'm sure the technicians here are as baffled at times over administrative decisions, including the matter of financing, as administrators are confused over the bewildering technical jargon that you technicians hope they will--or will not--comprehend. Sometimes I suspect the latter has been most effective--but not necessarily most productive. Nevertheless, the point I wish to make is that our problem is a common one. The technician is impotent without full support and active leadership from, as well as participation by, the administrator. The administrator is just as helpless without the full support, expert advice, and good counsel from the technician. Only by a close working relationship of the two groups can we expect to achieve the desired level of Communications Policy Formulation, Planning, Financing, Installation, Operation, and Upkeep of a truly efficient system.

Well, that's why we are here--to bring together the administrator and the technician for the purpose of capitalizing on previous mistakes and as a series of teams to develop concrete plans and recommendations to guide the Forest Service action program. It's a big order and our time is short.

You all have your committee assignments and have, I am sure, given a lot of thought to the subject matter in preparation for the meeting. As you can see from the agenda, your time for presentation and discussion of each topic is necessarily restricted, but we will try to allow enough time to make certain the respective committees have the group consensus and an understanding of special problems which may be pertinent.

In a conference of this size and composition, the real work must be done in committee. Accordingly, we have set aside the last 2 hours of each day for committee work. This may not be adequate in all cases and your chairmen may ask you to sit in on some evening sessions--on a purely voluntary basis, of course. In the preparation of Committee Reports, please reduce to essentials and catalog to fullest possible extent in 1-2-3 order.

George Duvendack, who, as you know, is heading up communications work in the Washington office, will be available to all committee chairmen and members for discussion of special problems. I'll be equally available, although I want it clearly understood that I am not an authority on any phase of the communications job. However, my work in Operation has brought me close to many of the problems and made me fairly appreciative of the job ahead.

I want to express to Region 6 the gratitude of the Chief's office--and I am sure all of you, too--for a fine job of arranging for this meeting and the multitude of details which go with it.

WELCOME: Brief Resumé of Talk by
H. J. Andrews

Regional Forester H. J. Andrews gave a welcoming talk and invited the group to call freely throughout the conference upon Region Six's personnel and facilities as needed. Mr. Andrews pointed out to the group that communications is a service which has to be paid for and is valuable in administering and managing the national forests. He cautioned the group to be economy-conscious and to exercise sound judgment in keeping planning and resultant establishment of communication systems correlated with justifiable needs and the ability to finance both the construction and maintenance of the resultant plants.

Topic No. 1MANAGEMENT'S JOB AND RESPONSIBILITIES

By F. V. Horton

This is a pretty all-inclusive topic and I hope you will forgive me if at times I encroach on topics assigned to other people. I guess if we knew precisely what the job and responsibilities of Management were, our course would be clear. The most I can hope for is that what I'll have to say will stimulate discussion from which we can reach some conclusions. I'll make some categorical statements which you may challenge. I'll assume the entire responsibility for these statements because there has not been time enough to clear with the rest of the Committee.

Preliminary to a discussion of the Responsibility and Job of Management, I believe we should have clearly in mind that communication facilities, whatever they may be, are simply the means by which we get our main job done. We are not running the National Forests just to have a place where we can operate communication gadgets. I remember once a telephone engineer told me that I must not ever forget that the reason the National Forests were created was so he would have trees to hang telephone wire on. He had the real specialist's viewpoint.

It seems to me the primary responsibility of Forest Service Management in the field of communication is to determine with reasonable exactitude (1) where we need communication and (2) the quality of service needed. In other words, the first determination, based on administrative needs, is from where to where do we need communication and, second, what quality of communication is needed between these points. For example, do we need 3-minute service 24 hours in the day 365 days in the year, or do we only need 3-minute service for 3 months each year? Maybe in some places, communication by mail is all we need.

These determinations of where and how much should be made with the Ranger District as the unit. Planning should begin on the outside of the circle and progress inwardly toward the Supervisor's office with the Regional Offices as a last consideration. This is in line with our present proven type of organization. Remember the justification for communication is getting the job done out on the ground.

I'd like to make it clear that this stage of planning is wholly the responsibility of management. They cannot shift this responsibility to technicians. As a matter of fact, up to this point I do not believe communication technicians should be involved at all. I'm afraid that too many times management has let the technicians do this job. Many times I have seen requests for communication equipment and communication plans which did not express the needs or wants of the field men, but were really what the technician thought the field man should have. I think this sort of thing is inevitable where management does not aggressively get into the planning job. This is a criticism of management, not the technicians. I guess management has had technicians take over their job and responsibility at times.

It is not until Management has indicated needs in communication that we require the advice and assistance of communication technicians. It is their job to advise Management as to the kind of communication facility which will meet the indicated administrative need. Final determination will, of course, be based on the usual considerations of service versus costs. Again it is Management's job to decide whether or not the costs are justified. If we violate the rules of good administrative management and mix up line and staff authorities, we will get into trouble.

I believe the time has come to do a real over-all Service-wide communication planning job. We have precedents for such a job in the transportation planning and fire planning jobs with which we are all familiar. The communication planning job isn't as big as either of these but will take top-side leadership if we are to have even reasonable coordination throughout the Service. As a first step, I'd suggest that the sections on Communication Policy and Planning be lifted from the Telephone section of the Communications Handbook and put in the Manual and thereby made effective. I wonder if policy ever belongs in a technical handbook?

Up to this point I have been talking mainly about Management generally. I guess I'll have to be pretty specific from here on if I am to be understood clearly.

I have not mentioned radio so far in my discussion because radio is just one of several communication facilities. The use of radio does introduce one factor into our communications job which did not exist when we had only telephone communication.

I'd like to toss in an idea here about radio versus telephonic communication. Radio will not give you any better quality communication than the telephone will. It may give you cheaper communication and it will do a few things which cannot be done with a telephone along the lines of portability. This is the field of greatest usefulness for radio. Other things being equal, i.e., cost and requirements, I think we should always use telephone communication. It is a proven stabilized means of communication and not in any way on its way into the discard. This may sound peculiar to you but the Radio Laboratory will always recommend the use of telephone communication where it will serve known administrative needs as cheaply as radio.

Unfortunately, radio signals don't stop at Forest or Ranger District boundaries. Also unfortunately the number of radio channels available to us are limited and are allocated to us under certain restrictions. This means that we must have centralized control of both frequency and power. I dislike centralization in the Forest Service as much as anyone, but here is one place where centralization of control is not only justified but imperative for our own protection. The use of airplanes is another important reason for over-all coordination.

I can't go past this point without commenting on the need for overhauling our operating procedure. We need some over-all rules on operating procedure and hard-boiled enforcement. The Coast Guard during the war handled 10 times our traffic on 3 frequencies. They said what they had to say and

got off the air. I've listened to hundreds of Forest Service radio communications and, frankly, the amount of useless yammering that goes on the air is inexcusable. We could learn a lot from the States and other operators of radio nets.

When we first began using radio in the Forest Service, the fundamental concept was to extend communication into the field beyond the end of our telephone system. Radio design was keyed to this concept. It was to supplement our telephone system. We also had the concept of extremely low power. We felt we should use the least power possible to meet the needs in the field. These concepts governed our early planning for the use of radio. We have departed a long way from these concepts now. We need to redefine some basic policy and, what is more important, set up the organizational machinery to enforce whatever policy is adopted. Admittedly, conditions and equipment have changed somewhat but it will take very much more convincing arguments than have heretofore been submitted to convince me that the above basic policy is not sound.

I suggest that within the Forest Service we set up a "little I.R.A.C." which, through the Chief along with other duties, would have final authority on the allocation of frequencies and power used. The personnel of this Committee should include at least someone from Operation and Fire Control in Washington and about two or three administrative officers from the Regions. The officer in charge of the Radio Laboratory should probably be a member of the committee in order to provide technical advice. Whether or not the latter is a voting member of the committee isn't very important.

If we can decide on the over-all Service-wide policy in communication work, the establishment of standards and guides for the effectuation of that policy should not be too difficult. It is assumed, of course, that we will follow our present organizational pattern.

One man's idea of the organization needed to effectuate Service-wide communication policy is about as follows, and it's pretty much in line with the advance-draft of the Communications Handbook. A communications position in the Chief's Office is now established. This job, as I see it, should be about 95 percent administrative and 5 percent technical. The first big job is to get some communications planning done on a Service-wide coordinated basis. This will require aggressive leadership and assistance to the Regions in the (shall I say?) new field of communication planning. This conference should furnish a good starting point. Again, I cannot help but feel that a Service-wide communication planning job, following somewhat the pattern of transportation and fire planning, is urgently needed.

In the Regions, communication planning should be an administrative function. There should be the closest cooperation between Operation and Fire Control at this level. Basic decisions should rest with administration, the technicians acting only in an advisory capacity. At the risk of being misunderstood, I believe it fundamental that technicians should only act in an advisory capacity. As to which division in the Regional Offices should be responsible for communications, that will, of course, depend upon the particular Region involved, but other things being equal, it is desirable that the Chief's Office pattern be followed. The Regional Communications officer should probably

have technical background. I wouldn't draw a line between men who had technical training in either telephone or radio or both and just a real bright chap who had no formal technical training but who had demonstrated that he "had something on the ball." Depending on the size of the Region, perhaps the Communication man should have from one to two leg men who would spend most of their time in the field assisting the forests on communication problems and training the Communication Assistants. Of the latter, my guess is that we need about one per forest. This last position is a "doing" job—not supervisory or inspectional.

Inspection could be handled by delegation from the Chief of the Division to his regular force, i.e., through the regular functional inspection procedure. The Communications officer would come in for his share of this, but should not be used just as an inspector.

I would like at this point to assure other administrative people that communication inspection isn't necessarily a technical job. I guess a lot of our people have been scared away from radio planning and inspection by the technical lingo. Actually, about all an inspector needs to know is whether Stations No. 1 and No. 2 can hear and understand each other if and when they have business to transact; and if the cost is commensurate with the service. If the inspector needs to know why they can't talk, maybe he should ask the technician. I doubt, however, if the inspector needs to diagnose the failure. He should be concerned with the organizational reasons for failure rather than the mechanical or technical reasons.

I have just sketched the bare outlines of a communications organization, but it's something to shoot at.

There seems to be quite a lot of misunderstanding about the functioning of the Radio Laboratory. As a matter of fact, the Laboratory has been operating strictly under the policy set forth in the Manual. Maybe you haven't been able to find this policy because, peculiarly enough, it is covered in the Office Management section of the Manual—Volume I, GA-I-7, pages 3, 4, and 5; and Volume 3, K2, page 1, and also in the Telephone section of the advance copy of the Communications Handbook. Most of our troubles in the Laboratory have their basis in the fact that the policy as clearly stated in the Manual has not been observed or enforced in the field.

First and foremost, let me state that the Laboratory per se has no administrative authority I don't think it should have. If at times it appears that administrative decisions are made by the Laboratory, it is strictly through and in accordance with authority delegated by the Chief's Office.

Second, the Laboratory is operating under a work plan of projects set up and approved by the Chief's Office. This work plan establishes what the Laboratory will do and when.

Third, Region 6 is in the same relative status to the Laboratory as any other Region. Maybe on account of the location of the Laboratory, Region 6 gets a little better break than other Regions because the people concerned

with communication can call on the phone and discuss problems with the Laboratory personnel easier than the other other Regions. Region 6 does the administrative chores for the Laboratory for the Chief but does not determine policy.

My guess is that most of the dissatisfaction with the Laboratory stems from the fact that almost any Region could use the entire time of the entire Laboratory on their own individual communication problems, including planning and procurement.

The greatest difficulty we have at the Laboratory is finding out what the field needs so we can focus our efforts toward getting satisfactory equipment as quickly and cheaply as possible. Let me say right now, as emphatically as I can, that without exception the Laboratory will first recommend commercially developed and manufactured equipment if it will meet the needs of the field. We have no desire to parallel the efforts of any other outfit.

If satisfactory commercial gear were available I would recommend curtailment of the Laboratory right now. We are not interested in radio "gadgets." We are not an experimental outfit in the field of radio research. Our whole aim is to find or develop equipment which will serve the needs of Forest Service and forest protection agencies. If someone else develops a better piece of gear, we are glad to accept it and recommend its use.

Now about the future place of the Laboratory in the Forest Service organization. I don't see too much wrong with the present Manual policy. Maybe it needs a little tinkering up to make it right up-to-date, but I'll venture a guess that if present written policies were enforced in the field of communication planning and the use of radio, the place of the Laboratory would be very clear. Frankly, I won't know how the Laboratory ought to function until I know how the Forest Service is going to function in communication work generally. At the present, I can only assume that Manual policy will be followed.

There is room for some argument about radio procurement. This should be restudied. The Laboratory has some ideas on the subject, but generally we look on procurement as a service to the Regions. It's a headache at best but if the general opinion is that we should do the job, we'll do the best we can, with the understanding that it's a time-consuming job which will take us away from straight development work.

There is one loose connection that needs tightening. I've mentioned before the difficulty of finding out what the field needs. If we met all the requests on the Laboratory for assistance and equipment just as requested, we would have to triple our personnel. Undoubtedly, we should have more contact between administration in the field and the Laboratory and also between the technicians in the field and the Laboratory. I've put these in the order of their priority in my judgment.

It may be that with a Communications Officer in the Chief's Office, requests for assistance, equipment, and development can be coordinated better than in the past.

I believe you will agree with me that developmental work should be centralized to avoid duplication of effort. We should be pretty strict about this. There has been too much time wasted "gadgeteering." There also has been too much professional jealousy in the technical radio field. I don't doubt that there are many technicians in the field who are just as well qualified to develop forestry radio as the Laboratory technicians, but suppose we just let everyone who had a flair for radio work take off on his own developmental program. My guess is that the field, generally, would get very little actual communication on the ground. Let's remember again that radio is only a means toward an end and that end isn't just to have more and better radios.

I guess I can summarize about the Laboratory about like this:

1. The present Manual policy about the job of the Laboratory is pretty good.
2. If we knew what the "Communications Program" was, we would more clearly define how the Laboratory should function therein.
3. The Laboratory should have no administrative authority per se. It should function in a technical advisory capacity to the Chief's Office.
4. Any dealings with Regions or other units should be under instructions or specifically delegated authority from the Chief's Office, following the usual Forest Service pattern of line and staff work.

Now to attempt to summarize this whole paper.

As I read back through the files I am struck by the fact that in 1935 and before, we were talking about the same things we are talking about here. We came to some definite conclusions which resulted in definite policy in writing and in the Manual. I guess one of the big reasons we are here now is because we didn't follow those policies. I suggest we take a careful look at these old policies first and bring them up-to-date, but above all, let's set up the machinery for leadership in and enforcement of established policy. I'll venture a guess that we wouldn't be in too bad shape right now if we had followed closely the spirit and letter of the policy now in the Manual.

Topic No. 2COMMUNICATION PLANNING

By B. A. Anderson

1. Determination of Communication Needs

In communication planning a determination must be made of the communication needs of the unit from a general administration viewpoint. The functional needs, particularly those of the resource management divisions, must be analyzed on the basis of existing and proposed management plans. Principal communication hubs of the forest must be located after consideration of individual functional plans, and particularly so of how they will be influenced by existing fire control plans. The life of the plan too will have a direct relationship with construction programs and financial considerations. Compromises in the degree of 100 percent communication will have to be made in accordance with funds available. We may have Cadillac appetites, but Fords get you there just the same.

The kind of communication plan which is finally adopted is going to be shaped and influenced to a considerable extent in accordance with the beliefs of the individual planners in centralized administrative control. The cost of construction and maintenance of the proposed system is directly influenced in an upward spiral proportionate to the degree of centralization of administration. Regardless of how much we may desire self-sufficient and failure-proof communication, we also know that it has to be paid for. Undoubtedly, another paper will have a good deal more to say regarding Congressional unresponsiveness to fervent pleas for more P&M funds, but I would like to emphasize that we never have and we never will have all the money we would like to have for communication purposes. Therefore, if communication planners insist on definite criteria to plan and devise a communication system, administration should assist by carefully weighing its needs and scaling down to a point consistent with the values concerned in comparison to the costs involved.

As a further expansion of this point, it is true almost without exception that the more insistent we are on centralized administration control, to that extent the man on the ground, the district ranger, is deprived of funds to provide communication facilities on his district. It is far more important that the grass-roots organization, the doer level, be provided with the very best of communication than it is that the upper-bracket supervisors be provided with fingertip information. And once again it should be emphasized that the communication system built around the ranger district unit automatically is relieved of the investments in the most expensive equipment, the cost of more technically trained assistants, and the complicated supervisory problems that are inherent in a centrally dominated system.

From a general administration standpoint it is relatively easy to determine the principal communication hubs on your forest. There can be no question regarding the designation of the forest supervisor's office and the district rangers' headquarters as primary centers. Except for emergency types of service such as those of Fire Control, practically all functional division needs can be satisfied through these administrative centers. The Fire Control needs

are dependent entirely on the type of Fire Control plans in effect on the unit. If a central forest dispatcher is the nerve center of protection, certain lines of communication are automatically dictated. If in turn forests are grouped in protection zones or interlocked regionally, the communication network must of necessity be patterned accordingly, if the protection system is to function.

2. Maintenance Costs

Communication planning in the future should very carefully outline costs of construction and maintenance, etc., so that a determination can be made by administrators as to the class of service to select. At the present time Regional allotments are made on the basis of the number of miles of grounded and metallic telephone lines in the communication system. With the development of radio communication followed by the abandonment of many miles of telephone lines, the relationship between the maintenance costs of the system and the maintenance allotments received is becoming more and more confused and unrealistic. It is my understanding that the people responsible for the determination of maintenance costs are extremely hazy in their exact knowledge of just what the changes in the communication system mean from a dollar-and-cents standpoint. As a matter of actual fact, the picture is so confused that maintenance allotments will probably be made to us for the next 5 or 6 years on the basis that our communication system is now 100 percent complete as it was planned 10 years ago before radio was accepted.

Communication planners must provide better cost analysis data in communication plans. The cost of maintaining the telephone system, naturally, because of our long years of familiarity, is fairly accurate. You certainly cannot say the same for radio installations—at least the data have not been put out in a form that has been understood and accepted by administrative personnel.

That there should be some uncertainty, indefiniteness, and inaccuracy in the cost data of radio installations is understandable. Technical developments and improvements have occurred so rapidly that one piece of equipment is outmoded before you know how to operate it—much less amortize it. That merely complicates the job of the planners and because it does represent such a problem for everyone it is the reason why the cost phase of communications planning should be emphasized.

In addition to the cost phase of planning, we have a selling job on our hands. There is an inherent reluctance on the part of most people to discard a tool—in this case a telephone line—for something new. The end result usually is a duplication of facilities with the corresponding dissipation of maintenance funds. Communication planning problems in this respect are no different from those occurring in transportation. Witness the present struggle on the big-fire forests to resolve the relative values of the helicopter, airplane, truck, and the lowly mule.

In final emphasis: the communication planner must be more cost-conscious; provide better cost data; be absolutely sure the communication facility proposed has been sold to the point that it will be accepted and not result in a duplication of facilities.

3. Cooperator Needs

Greater emphasis should be given to the exchange of information with other agencies. The planners should have an intimate knowledge of basic working relationships with cooperating agencies. Because of intermingled State, county, private, and Forest Service lands, it is necessary that special consideration be given to provisions for connections with their facilities. As a matter of fact the Forest Service should probably go further than it has in attempting to evaluate the future needs of State Forestry and Timber Protective Association organizations where their activities are intertwined with those of the Forest Service. To do so would probably result in financial savings for all concerned. In addition to this the very fact that these organizations are substantially financed with Federal funds through the Clarke-McNary Act is indicative of the national viewpoint of their importance to conservation—the basic reason for our own activities.

It may seem trite and entirely unnecessary to stress cooperator participation of this type in our communication plans. However, we are all familiar with the repercussion on our own organization when an interlocking protective association goes out of business or an agency decides to place its adjoining lands under a cooperative protection agreement. Communication plans should take into consideration not only existing cooperator relationships but future conditions as well.

No less real but somewhat simpler to deal with as a rule are the interagency connections represented by law enforcement groups, the Park Service, Indian Service, Grazing Service, Reclamation Service, etc.

4. Private Cooperators

A particularly difficult problem is represented by the isolated individual or in some cases small communities which are dependent on Forest Service facilities if they are to enjoy any form of communication. During the past year our Region has been confronted with four separate cases of this type of problem. Invariably the people concerned are listed as cooperators. During the early pioneering days of the Service many of them were—many still are. In any event the manner in which the Forest Reserves were set aside through proclamations which included large solid blocks of land with subsequent eliminations through the homestead laws principally, created an alienation pattern of relatively isolated tracts. For the most part they are so scattered that it is economically impossible for the owners of the tracts to own and operate a private communication system. Where acquisition programs have eliminated the bulk of alienated lands, communication problems of remaining owners often present especially acute and touchy problems. Generally these people have played an important part in the development of the forests. They have harvested the national-forest products and thereby added to the community tax base and wealth; they have provided lodging and subsistence to forest personnel; they have been the backbone of our improvement crews, our per diem guards, and emergency fire personnel. In many instances, however, our pattern of administration has grown away from intimate contact with the at-one-time cooperators. A revised communication plan might not include their needs. There has been too much of a tendency to disregard them. Because of the semimoral but not legal obligation involved;

the fact that these people still are a second-line defense in our protection organization, that abandonment of present lines would represent actual hardship, and a realization that many of them are staunch supporters of our conservation policies, the abandonment of such lines is definitely a question to be answered by the administrator before plans are consummated. Admittedly the decision to furnish or deny these cooperators telephone service is a difficult one to make. We cannot compromise our own system of communication to the point where efficient service is endangered. It occurs to me that we could go further than we have in assisting these people to form telephone cooperative associations. That seems to be the answer in at least one particularly aggravating case we are trying to solve. The Forest Service ordinarily will have to take the initiative in the formation of any cooperative for various reasons.

By assuming the responsibility with good grace we can usually solve the problem to everyone's satisfaction and in addition win a lot of good will from the people concerned.

5. Equipment and Handbooks

Those of you who are daily brought into contact with all of the complex instruments and equipment devised to overcome every problem in providing a high standard of communication acquire a terminology that is just a little less understandable than Greek to the average forest worker. The completed construction of every facility and every instrument needed to make the communication plan function has to be maintained. And that maintenance work for the most part will be done by semiskilled labor with little technically trained assistance available. As a consequence our communication system components must be kept as simple as it is possible to keep them.

Just as an example, I have had radio engineers demonstrate and explain operating procedure of highly efficient receiving and sending units. One look at the button-besprinkled panel was enough to discourage me from ever believing I could talk over it. "But all you have to do," I'm told, "is to turn on the current with this button and tune in with this one." If that is the case, then why don't we throw all of the other buttons away? Of course that's an exaggeration, but I want to emphasize that to be usable our communication plans have to be kept simple and understandable. Our handbooks and instructions must be prepared with less written text, more pictures, and simpler diagrams. By the way, what has become of the pocket-size telephone maintenance handbooks that field workers were furnished and which served as the connecting link between our planned communication system and its workability?

Format of Regional and Forest Plans

There is a reluctance on my part to attempt to standardize presentation of Regional plans in a single formal mold. Would it not be satisfactory if planning material was worked up under four general breakdowns as:

1. Determination of communication needs and standards of service to be provided.

2. Inventory of all existing communication facilities. This information to be tabulated on forms and supplemented with $\frac{1}{4}$ -inch maps for the supervisor's office and $\frac{1}{2}$ -inch maps for ranger districts.
3. Final communication system supplemented with cost data.
4. A new construction and abandonment program.

We probably could go further than we have in using the same forms in all Regions for presenting the same data. There may be two Regions that use the same form but if they do it is a matter of pure coincidence. Any one of us who happens to transfer to another Region can be reasonably sure he will have to familiarize himself with a new set of forms and pole and circuit map legends. We are in somewhat the same condition as the mechanical equipment maintenance sections found themselves last year—126 forms that reduced themselves to about 30 when the Forms Committee finished using their shears.

In general I believe the planning committee in setting up any outline for planning a system would favor procedure that would enable a Region or Forest to fit the plan to its particular situation rather than to try to reverse the procedure. The approach, standards, guide lines, and actual planning work should follow a general pattern, yet not be so rigid that it could not be shaped to take into account in the most practical manner the problems and situations peculiar to an individual Region or Forest.

Topic No. 3A STUDY OF FREQUENCY AND POWER ALLOCATIONS

By G. H. Duvendack

The art of radio constantly makes forward strides. The present-day equipment is reliable and its performance is high. Because of this there is an ever increasing demand on the part of old users and of potential new users for expansion of its use. A large share of this demand cannot be satisfied.

The principal reason that the demand cannot be satisfied is that available frequencies are for the most part allocated and are carrying a capacity load. I like to compare the radio spectrum to a lifeboat. Both have limited capacities. If the lifeboat is overloaded it swamps and sinks and thereby does not fulfill the job it was intended to do. There has to be control on board ship to insure that the ladies and children are loaded first; second, that the craft is loaded only to its safe capacity. It was recognized early in radio history that control must be exercised in the use of the radio spectrum to:

First, insure seats for the ladies and children—those services that are of necessity dependent on the use of the air for communications such as marine and aeronautical navigation services and ground or land emergency services that must function when wire is not available or has been destroyed by fire, flood, or other disasters.

Second, that control must be exercised to insure against overloading of frequencies and at the same time to insure that frequencies carry capacity loads.

Control of the air for transmission of intelligence must of necessity start on a world-wide basis because of the long-range propagation characteristics of many frequencies and other phenomena peculiar to radio. For example, the United States could do a bang-up job of regulating and controlling the use of frequencies within its borders and then could have its efforts come to naught if Mexico would allow the users of radio in Mexico to run wild. Both the United States and Mexico and all the other countries must control and regulate their nationals who use the air so that each country's use dovetails into a world-wide pattern of use.

The world-wide pattern is designed by an international body now known as the ITU or International Telephonic Union. The last meeting of the ITU was held last summer from July to October in Atlantic City. More than 600 delegates from 78 countries labored on the problems confronting the Union. Radio engineer Mr. A. G. Simson was one of the United States delegates. He represented the War Department.

The purposes of the Union as set forth in Article 3 of the FINAL ACTS of the INTERNATIONAL TELECOMMUNICATION AND RADIO CONFERENCES, Atlantic City, 1947, are:

- (a) "to maintain and extend international cooperation for the improvement and rational use of telecommunication of all kinds";

- (b) "to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public";
- (c) "to harmonize the actions of the nations in the attainment of those common ends."

One of the jobs of the Union undertaken to meet the above objectives was to effect allocation of the radio frequency spectrum and the registration of radio frequency assignments in order to avoid harmful interference between radio stations of different countries.

Harmful interference is defined as: an undesired signal which jeopardizes or repeatedly obstructs or interrupts the normal operation. The two words, repeatedly obstructs, are important to remember. To eliminate interference altogether would mean a very radical reduction in number of users of radio and in the amount of traffic now transmitted.

Later in this paper I will cite the changes in the allocation of the radio frequency spectrum decided upon at Atlantic City which bear on Forest Service frequencies.

The next echelon of control for us after ITU is a committee known as "Interdepartment Radio Advisory Committee" (IRAC). Its duties are:

1. To assist and advise the President of the United States in the assignment of radio frequencies to Government radio stations and classes of stations. Frequency assignments for non-Government agencies are handled by FCC.
2. To assist and advise the President and various Federal agencies on related technical radio problems of interagency interest.
3. To authorize interim or temporary operation and to withdraw or modify such authorizations on any frequency pending issuance of a new Executive Order assigning frequencies, provided that such action is consistent with agreements between the IRAC and the Federal Communications Commission.

The membership of IRAC is composed of one representative accredited by each of the following agencies: Department of Agriculture, Department of Commerce, FCC, Department of Interior, Department of Justice, Maritime Commission, Department of the Navy, Post Office Department, Department of State, Treasury Department, Department of War, and Department of the Air Force. Mr. Loveridge is the accredited representative for the Department of Agriculture.

Article X Section 5 entitled "Obligations of Operating Agency" of the IRAC bylaws adopted July 3, 1946, imposes definite obligations on us. Some of these obligations are specified in treaties and laws. The important ones follow:

(a) Equipment Standards

"To make the fullest use of the radio spectrum and to reduce interference to a minimum, it is the duty of each operating agency to use the best and most selective radio apparatus the state of the art and service operating requirements permit."

(b) CCIR (International Radio Consultative Committee)

"Operating agencies should recognize current CCIR opinion as minimum standards of apparatus and operation and, insofar as practicable, conform thereto."

(c) Economical Use

"It is incumbent upon all operating agencies to use frequencies economically, that is to avoid unnecessary emissions and to conduct operations on a minimum of frequencies."

(d) Sharing

"Interagency sharing of frequencies is a recognized and necessary expedient for the fullest utilization of the radio spectrum. This and other intensive utilization practices, such as close spacing of frequency assignments, may entail the acceptance of some interference but does not contemplate requiring the acceptance of harmful interference. The full possibilities of sharing should be explored before an agency requests an exclusive frequency assignment."

Of particular interest and concern to this group are the following excerpts from the bylaws of IRAC:

1. "Applications for radio frequencies for services duplicating adequate existing facilities are not considered in other than exceptional cases."

2. "The IRAC aims to insure that the frequency selected, insofar as possible, is one having transmission characteristics best suited to the proposed use; that national and international allocation plans are recognized; that the frequency stability is the best the state of the art and service requirements permit; that minimum power consistent with satisfactory performance is employed; and that the frequency band width of emission is the most restricted consistent with satisfactory communication. Assignments are made with due engineering consideration of the probabilities of adjacent channel interference, and after careful study of the possible effect of the assignment on frequency assignments and uses. If an assignment is made where there is a probability of interference, appropriate restrictions are placed on the assignment."

3. "A group assignment is the assignment for use in a general area or areas and may cover many specific locations. The purpose of such assignment is to authorize various classes of stations for low power operations where harmful interference to other services is not likely to be caused."

The preceding part of this paper can be summarized as follows:

1. That the maximum use of the air for communications is made possible by cooperation and a spirit of give and take and pooling of technical knowledge on the part of all countries.
2. That strict control is mandatory on all levels to assure:
 - (a) That those services that cannot maintain adequate communications except by the use of radio waves are cared for first, i.e., marine and aeronautical. The Forest Service qualifies under this caption for it is necessary that it have communication throughout the "land oceans" it protects from fire.
 - (b) That the maximum use be made of frequencies assigned before application is made for additional ones.
 - (c) That minimum power be used.
 - (d) That it is incumbent on all users of radio to adhere not only to the letter of the law or policies laid down for the use of radio but, more important, that the spirit of the law or policy be followed. This means that in many cases the desires of the individual are subjugated, but assures that the whole is better served.

The Forest Service is sitting in clover, so to speak, by comparison with many other agencies. We have at this time an adequate number of frequencies. We enjoy group assignments. Automatic River Gages are the only ones other than ourselves that have group frequencies for fixed stations. We enjoy this position because of limiting ourselves to 25 watts power. The value of group assignments needs no explanation, for it is readily apparent that the privilege of shifting stations at will without the necessity of securing an authorization has untold value. Interior submits applications for all of its stations.

We have 29 frequencies in the H.F. (3 to 4 mc.) band, 12 of which are clear; we have 71 frequencies in the V.H.F. (30 to 40 mc.) band, 23 of which are clear. The Department of Agriculture has 26 frequencies in the 164 to 172 mc. band. We can secure any of these that we need. In addition the Department has 8 allocations in the 216 to 219 mc. band and 8 in the 411 to 415 mc. band. We can secure assignments in these any time we need to. Our favorable position can be laid to three factors:

1. We were in practically on the ground floor.
2. Mr. Loveridge and his assistants, guided by able technicians, exercised good judgment and foresight in securing our frequencies.
3. That our policies for and the use of radio communication have conformed to the pattern handed down by the ITU and the IRAC.

The effective date of the new regulations promulgated at Atlantic City is January 1, 1949, except for the frequencies in the bands below 27,500 kc. The only changes in the new regulations which affect us are in these bands. These bands are to be reengineered so that they will be more free of interference than they now are. This work will be done by the Provisional Frequency Board of the ITU. The board is international in character and work. It has already convened in Geneva. Captain Miles, who was the FCC representative on IRAC until he resigned a short time ago, will be the chairman of the PFB. The United States delegation to the PFB is composed of some 20-odd representatives of Government agencies and industry. It is backed by a home team composed of 16 members representing Government departments, the FCC, and large communication companies such as AT&T, RCA, and Mackay Radio & Telegraph. Dr. Dullinger of the Bureau of Standards is chairman of the home team and Mr. Wagner of the Forest Service represents Agriculture. The recommendations of the PFB are expected to be completed in about 15 months and will become effective when accepted by a special conference of the members of the ITU.

The picture as I see it doesn't look very rosy for the retention and use of the frequencies we have from 2952 kc. to 5905 kc. These frequencies fall into bands that have been allocated to marine mobile and aeronautical mobile and fixed stations. No doubt we will be allowed to continue to use these frequencies after the PFB's recommendations have been accepted if we do not cause harmful interference to the services to which they have been allocated. However, it is quite possible that there will be so much interference to us that we cannot make use of these frequencies. If the worst condition develops, we shall be forced out of the H.F. bands.

Every effort will be made to protect our interest through our representative on the home team. However, I feel certain that safety at sea and in the air will receive first consideration and the PFB will engineer the allocation of these frequencies so that they serve their greatest usefulness. My feeling is that we should analyze very carefully any expansion of our H.F. system or heavy investment in replacement gear.

Topic No. 4INTER-SERVICE EQUIPMENT STANDARDIZATION
AS RELATED TO NATIONAL SECURITY

By Walter H. Campbell

Mr. Nordwall, Mr. Andrews, Mr. Duvendack, members of the Forest Service Team:

The Signal Corps appreciates the opportunity to join you in a discussion of so vital a field as communications, even though circumstances necessitate participation by proxy.

Communications is a problem common to all of us, a necessity in our everyday living, in our vast industrial and commercial activities, in our government, and is obviously vital to our national health, economy, and security. The very universality of the problem demands a common solution through coordination and integration.

We live in a technological era, a period of tremendous advances both scientific and sociological, but one that brings like increases in responsibilities—responsibilities of daily life and job assignments—responsibilities for the future.

You gentlemen belong to a widespread team of public servants organized and operated in a system that has rendered invaluable service to our Nation. Your efforts, individually and collectively, have been unselfish and untiring—your responsibilities heavy. Yet each of you must expect those responsibilities to increase and increase rapidly, for as our tempo of living increases, our need of forest resources increases.

The timber, the grazing, the watershed protection, the recreational facilities are all vital to our national economy and way of life.

To meet the increased responsibilities under higher tempos, it is imperative that modern methods and facilities be increasingly employed. The mechanization demanded to effect greater results must be accomplished under stringent economy. Integration of all activities in this field may be required in an emergency. Cooperative-coordination in peacetime is the means of obtaining this intra-agency objective.

There is no element of our Nation that is independent or stands alone either in government, industry, or public living. All are interdependent, all are members of one vast team. The technical advances and capabilities of all team members must be completely integrated if we are to continue to progress as a nation.

You gentlemen, and the Service of which you are vital parts, rule vast areas of the United States; areas upon which we depend and which we must defend from waste and sabotage, and perhaps direct aggression.

Your extended systems of trails and roads, and communications, might become vital to our national security. The establishment and maintenance of those systems must, therefore, be evaluated and effected with this possibility in mind. In our planning, and in the implementation of those plans, we must assure integration in effect and in detail to provide for the possibility of using those systems as the main trunks in being, for national defense.

Although we all hope that the need may never arise, we must provide preparedness for a national emergency. Such decrees that, if necessary, the Armed Forces can operate in those vast areas now under your control. This means that the communications which you use in your normal work should be designed, established, maintained, and operated in such a manner that they are capable of being integrated into a single national defense system. This, in turn, calls for standardization, not only of materiel design characteristics, but operational procedures as well.

It is understood that the Forest Service has in its 10 regions approximately 3,000 radio equipments valued at about \$14,000,000. Some of the 25 different types are, or have been, used by the Signal Corps, such as Radio Set SCR-274-N and the Link Equipments Type FMTR. In addition, the Service has an extensive network of wire communications, much of which is understood to be "open-line," often of the single-wire ground-return type.

The communications materiel requirements of the Forest Service and those of the Armed Forces are surprisingly similar. Both require fixed nets of wire and radio. Both require mobile and portable equipment for emergency and field nets. Even some of the airborne needs such as for paratroopers are common.

In analyzing these common materiel requirements, it appears that there is a wide field in which the agencies could, through coordination, achieve a large order of intra-service standardization and thus provide the preparedness for integration if national security demands. If, for example, all regions of the Forest Service were equipped with standard type field telephone units such as the EE-8-(), standard field and combat wire, standard switchboards and line construction, and a standard family of radio facilities, the resulting system could be readily integrated into, and operated as a part of, one vast national communications net if it became necessary to maintain our national security by direct defense.

Logistically such standardization would reap large benefits by lowered costs through larger runs on fewer designs, pilot lines could be kept open and available, cross-service supply would be obtainable, maintenance improved, and time schedules reduced.

Standardization of dry batteries, electron tubes, and other components would facilitate adequate and timely supply in both peace and war. Such items as telephone transmitters and receivers can be made much more available as well as giving increased performance through coordinated design and procurement.

Our national economy decrees economy in government. Standardization in equipment designs facilitates economy by prevention of duplication, pooled procurement, lowered stock quantities of maintenance parts, and greater service by continuity of operation. Standardization is a necessity, an obligation of all agencies.

If the Armed Forces have requirements for an item, conceived, developed, and proved by the Forest Service, such as the Beetle Tractor or the Trail Mule, it would be folly to start from scratch and relive the headaches of such development. Likewise it is not economical for the Forest Service to develop a field type telephone, or a radio set, if, say, the Signal Corps has a standard, proved item that will adequately meet the Forest Service requirement.

Standardization is not limited, however, to equipments. The component parts, the supplies, the actual nets and systems such as open-line installations, must be standardized and integrated to the maximum practical extent in the interest of national security and economy.

The first major step in interagency standardization is obviously a universal system of nomenclature followed by universal specifications. Attempts have been made to establish such a universal system but the task is great due to the wide differences in procedures and fields involved. The effort is also handicapped by the usual limitations of personnel and funds.

The Forest Service has its own system of nomenclature, specifications, and technical information. This system, like those of other agencies, is subject to evolution and change as required. In this presentation there is no intent, however, of recommending the adoption of the Signal Corps system or the Joint Army-Navy system employed in general by the Army, Navy, and Air Forces, in the field of Communications, Electronics, and Allied Materiel. Some data concerning this system is submitted for your information and as background in your consideration of Inter-Agency Equipment Standardization as related to National Security.

The basis for the Armed Forces nomenclature system in the communications field is given in the "Summary of Joint Army-Navy Nomenclature System" (normally called the "AN System"), and TB SIG 103 "Nomenclature Designations in Signal Corps Publications," copies of which will be available to such committees as are concerned. The summary is self-explanatory, showing the standardized indicators and groups which put together designate a specific item of materiel, having stated characteristics.

Backing up the standard nomenclature for a specific item are standard specifications. These may pertain to one agency, if the item is peculiar to its use, or be Army specifications, or be joint with the Army, the Navy and/or Air Forces, or they may be Federal specifications applicable to all Government agencies.

Clear, complete specifications are a MUST if the resulting item is to fulfill its intended mission. The multiple-agency use of standard specifications can result in big savings in supply, maintenance, and operation, while giving the flexibility, interchangeability, and net-ability required by integration.

Let us illustrate the field of standardization by a little history and a few facts. On 17 December 1943, the Signal Corps Standards Agency was re-organized to include standardization activities of both the Army and Navy in the field of communications and electronics. The name was again changed in December 1945 to the Army-Navy Electronic and Electrical Standards Agency, and continues to investigate and effect standardization in this field for all Armed Force activities. Tremendous benefits have been and are being derived from these activities not only by the Armed Forces but by other governmental agencies and industry itself. The betterment in ruggedness, life, low weight and size, climatization, universality of use, benefits all users in this field.

The following are examples of the extent of savings that can be obtained by standardization:

- a. 66,000 different types of indicating instruments used by the Armed Forces were reduced to 3,000, tripling production by 5 large manufacturers and reducing average cost from \$10 to \$5.
- b. 2,300 required types of electron tubes were reduced to 224.
- c. The number of radio frequency cable types was reduced 80%.
- d. The number of required piezoelectric crystal holder designs was reduced from 361 to 3.

It is realized that the magnitude of procurement and the number of equipment types of Forest Service materiel do not offer an opportunity to effect such large reductions, but the potential savings remain proportional. By standardization the Service can obtain better equipment and greater results at lower cost. By Inter-Agency standardization the Government and, thus, we-the-people would benefit.

The Signal Corps salutes you of the United States Forest Service for your past performance and planned future. It solicits your aid in our common problem of standardization and preparedness for integration if such becomes necessary to our national security.

Topic No. 5

BASIC NEEDS FOR--
RADIO SECTION OF THE COMMUNICATIONS HANDBOOK
STANDARD OPERATING INSTRUCTIONS
STANDARD NOMENCLATURE TEST

By Gaylord Knight

In this paper I will try to give you, as I see them, the basic needs for the "Radio Section of the Communications Handbook," "Standard Operating Instructions," and "Standard Nomenclature List."

The second and third parts of this topic should be included in the Radio Section of the Handbook, and will be considered as a part of it, but will be discussed separately.

For our floor discussion and committee work sessions, I will appreciate it if all will make notes of any points on which you do not agree, or suggestions you wish to make, for discussion.

What is needed in the way of a communications handbook for radio?

This is a large and far-reaching question, particularly when you think of the hundreds of men that will depend on it for help and guidance. One wonders what each will want to find when he turns to it, and in what way can all that is desired by both technical and nontechnical men be included without getting out of the single handbook class into many volumes.

First--What is a Handbook? Why is it needed? What use will we make of it? To me it should be a tool--a tool to guide and assist both technical and nontechnical men in the use of Forest Service radio.

It should supply the administrative, or nontechnical man, with all he wants to know regarding the various types of Forest Service radio, and the application which can be made of each, within his Forest or Region.

It should supply the technician with complete data needed for the installation, maintenance, and operation of the equipment.

Basically we need a Handbook that is a usable tool, for all that will need to use it. This will require that it contain, first, the necessary information, and, second, that it be sectionalized, and provisions made for binding that section or sections, as needed for office, shop, and field use, in addition to the complete handbook binding.

It is not intended that I attempt to give a complete outline for the handbook; such will no doubt require the time and thoughts of many. However, as a general outline and food for thought, I will suggest the following for a Handbook consisting of these general parts:

Part A

To consist of general information for both technical and nontechnical men, regarding policy, organization, frequency, frequency tolerance, transmitter power, general information on equipment by types, an explanation of its intended use, advantages and disadvantages of AM and FM radio, and H.F. and V.H.F. frequencies.

Part B

Radio operating and message handling, and operating instructions for each type of set.

Part C

Technical antenna data.

Part D

Installation standards, including illustrations of installations for mobile and fixed station equipment in various types of towers, buildings, and cars.

Part E

Service equipment for shop and field use.

Contents of Parts More in DetailPart A

Section 1 - Retain, bring up to date the bit of history contained in the "Introduction" of the existing Handbook.

Section 2 - Retain and revise as necessary, Section A2-0 regarding "organization" of the existing Handbook.

Section 3 - Include all Forest Service policies concerning development, procurement, modification, and use of radio.

Section 4 - List all current frequencies allocated to Forest Service.

Section 5 - Give maximum transmitter power output that may be used for various types of service.

Section 6 - List transmitted signal frequency tolerance for various types of service and frequencies.

Section 7 - List all types of Forest Service radio equipment by types and model number, together with a description of the equipment, and an explanation of its intended use. List sets which can be used together, depending on frequency and type of modulation.

Section 7A - IRAC rules and regulations governing operation, and use of Forest Service frequencies.

Section 7B - Include FCC rules pertaining to operation of Forest Service equipment.

Section 8 - List for the nontechnical man's information the principal differences, advantages and disadvantages, between AM and FM radio as used by the Forest Service. Include also the difference between high frequency and very high frequency for field use, pertaining to range, static, electrical interference, and interference from other stations. (Include Section 8 of Part A in Part B, Section 1.)

Part B

Section 1 - Radio operating and message handling. (This will be discussed in detail later.)

Section 2 - Operating instructions for each type of radio, with illustrations and data to give simple and complete information needed by the operator for setting up and operating the equipment.

(Show R-8 "T" set Manual and "SPF" Manual)

Part C

Section 1 - Technical data on antennas; list dimensions, give formula for determining correct dimensions; information which will guide the technician in selecting the most suitable antenna for any particular installation, or type of radio communication.

Reference to additional data in standard textbooks on antennas.

Section 2 - Antennas for special applications--such as directional antenna arrays.

Reference to textbooks for additional data.

Note: This information on antennas may include theory as thought necessary, but should consist, for the most part, of usable data with dimensions, material needed, and illustrations which can be used for the construction and installation of antennas by the field technician.

(Show Link Beam Antenna drawing)

Part D

Illustrations and general data for typical installation methods for antennas and equipment. Including lightning and equipment protection for fixed and mobile installations.

Example: Method of attaching antenna to tower or car—running and clamping cable—cable entrance to cab—set location, and mounting details.

Part E Test Equipment

Section 1 - List of basic and special test equipment with general description or manufacturer's type number needed in Regional or Forest repair shop, as well as portable test gear for field use. Such as signal generator, VTVM, oscilloscope, type A test set, tube tester, and SX test meters.

Part F Tools

Basic list of tools, as needed for shop and field use, for the installation and maintenance of radio equipment. Such as soldering irons, pliers, wrenches, vise, files, socket wrenches, and various sizes of screw drivers.

Part G Standards of good shop practice

For example:

Type of work bench.

Test equipment arrangement.

Work bench lighting.

Care of tools; keep clean, screw driver bits properly shaped, drill bits properly sharpened; care of test equipment, test leads, how to care for soldering iron, how to solder properly; neatness of work.

(The care of tools and neatness of work indicates to a large extent the quality of the work produced by the technician.) Not many men do their best with inadequate or poorly kept tools.)

(Show War Department Manual TM-11-453: "Shopwork,"
and Amphenol cable stripping)

Part H Service Data

No doubt this section of the Handbook will be used more than any other, at least by the technician engaged in the repair of equipment. If this section contains all the data necessary for circuit analysis, isolation and correction of trouble, correct adjustment and over-all test of equipment, we may expect a faster and more efficient repair job.

Individual technicians will, in many instances, use different techniques or methods in locating and correcting trouble in equipment and not all of these are efficient.

If a complete circuit analysis is given, and an outlined test procedure is given for each section, the time required for repair can be reduced and we will have equipment which operates nearer its maximum efficiency.

The service data given in the existing Handbook are good, and, in many cases, are adequate. However, I believe that they can be improved upon in many instances. The ability of technicians varies greatly. While one may be able to quickly and efficiently repair a set with the aid of only the wiring diagram, from this he can analyze the functions of the various circuits by calling on his basic knowledge of theory and long experience, another may spend hours analyzing circuits before he thoroughly understands what the function of each circuit or component part is, and, until he has done this, cannot really begin the isolation of the trouble and effect its repair.

The service data given should be in such form that they will serve for the second man as well as the more experienced and better-trained man.

The service data for each type and model set should include the following:

1. General description.
2. Electrical specifications.
3. Physical specifications.
4. A complete explanation of how each section functions, particularly such circuits as noise silencing circuits, squelch circuits, signal operated relay circuits, etc. Example--

(Show FMTR-7a, page 23, part of Section 6
and 1779 Selector, page 5)

5. A schematic diagram of the complete unit, including remote control cables, control heads, etc.
6. Top and bottom views of each unit, with indication of part location and part number corresponding to that given on the schematic diagram.

(Show FMTR-7a, pages 11 and 25)

7. A drawing which illustrates the location of the component parts and the wires connecting them in the circuits. Example--

(Show FMTR, page 27)

8. In addition to the practice of giving voltages at socket pins, normal voltages (and currents in some cases) at other points in a circuit should be given; particularly in such circuits as squelch, noise silencing circuits, and AVC circuits. These should be given for normal operation with and without signal, and for varying input signal strength.

For some circuits, such as squelch or AVC, this information can be included with the explanation of the circuit function, as well as being listed on a separate page.

9. A system used by Philco, which I will call "tests to isolate trouble," is being used by B.C. service men and I feel that the basic system can be used with equal success by our technicians.

This system tests the circuit by sections. The tests are listed by steps, and test points--switch settings, signal, etc., are listed, together with normal indication and possible cause of abnormal indication. With these data is shown a schematic of the section under test and a drawing which clearly shows the test points used. Example--

(Show Philco data model 46-431, page 5)

This basic system can of course be used for transmitters as well as for receivers. However, it will probably find most of its use in receiver service. My experience has been that receivers require more service than transmitters.

10. Of course the job would not be complete until the circuit alinement has been checked, whether the unit under test is transmitter or receiver. Transmitter circuit adjustment is usually checked by current measurement at two or more points and modulation checked with an oscilloscope or a test on the air, and is relatively simple. However, the receiver takes a bit more time, and, to some extent, more accuracy. The alinement procedure should be outlined in steps by stages, giving the input signal voltage and the gain to be expected under normal conditions for each stage, and the output to be expected with an input of specified strength.

Data should be given which will enable the technician to give the receiver a final test for sensitivity, squelch, noise limiter, and discriminator action.

The job of alining can be simplified if the alinement procedure is accompanied by a drawing of the set indicating where adjustments are to be made for each step or stage. This eliminates the necessity of reading the procedure and then turning to another page to locate the adjustment. (An illustration of this is given in the Philco Manual, page 6. The procedure is given in steps with lines coupling the information with the condenser to be adjusted. I believe this method will simplify this part of the job.)

Binding

Going back for a moment to the idea that the Handbook should be a usable tool. The existing Handbook is not made up in such a way that it can be used readily in either office, shop, or field.

1. First, I think the Handbook should be made up in loose-leaf form, to be assembled in one form for office and shop use, and in another for field use, and, in addition, provision made by the use of extra backs to assemble those sections needed for any one type of work. This will reduce the size and increase the ease of handling.
2. There should be available, where needed, a copy for office and shop, which includes all sections.
3. Sheets should be standard 10 $\frac{1}{2}$ - by 8-inch size.
4. The technician should have available for shop use at a work bench the "Service Data" section, preferably with data on each set in a separate binding. This should be in a binder which will allow the backs and sheets to lie flat on the bench, such as a ring binder or one of the patented binders which allow the pages to lie flat. (R-8 has had the Handbook in 4 loose-leaf sections for 2 years.)
5. The technician should have available a smaller form for field use where it is not always convenient to use the larger one. This could be the size of the Bell System practice handbooks or the pocket edition of the Telephone Handbook. It need contain only the data on the equipment in use on that particular Forest or District.
6. The "Radio Operating and Message Handling" section, and the "Operating Instructions" for any one or combination of sets, should be assembled in pocket size for use by operators.

Region 6 "Radio Operators Notebook" is a good example, except that actual set operating procedure should be illustrated fully in all cases.

Region 5 has a good list of regulations. [Sample.]

Revisions

Our Handbook will lose its effectiveness as a tool unless it is kept up to date. Revisions should be made promptly when the need is apparent. When a new type set is released for field use or revision is made in an older model, data for the Handbook should be distributed at the same time.

...

Second—Standard Operating Instructions

This subject, I believe, should be divided into two sections, pertaining to operating.

One deals with the handling of messages and the operating rules for this phase of operating.

Two deals with the technical details of setting up and operating a transmitter and receiver.

Part one should include the laws and regulations which govern what we transmit, and how to operate efficiently. Region 6 "Radio Operators Notebook" is a good example of this. Region 8 also has used the same idea for some time.

(A few examples—from R-8 Operators Handbook, pages 7 and 8)

Standard Operating Instructions

There should be included a sample of the procedure used in calling, answering, giving the text of the message, standing by, and signing off.

No doubt there are now being used throughout the Regions several variations of message handling. Any system used should tend to give as fast and accurate transmissions as conditions and personnel will permit. All of us have listened to the fast handling of messages by the airways, police, and, recently, taxicab companies, even where many separate organizations are using the same frequency and interfering with each other. For speed and number of transmissions per hour, I don't think any compare with the taxicab companies. Recently I talked to an engineer with a commercial company, who told me of a taxicab company which averages over 10,000 transmissions each 24 hours, between the dispatcher and 200 cars. They use numbers almost entirely. A typical transmission will be 34 to 87, meaning that car 34 had picked up a passenger, and was enroute to the Union Station. Another from the dispatcher to a car might go like this: 34 to 1716 White - 2 - 87, meaning 34 to pick up 2 passengers at 1716 White St. to go to Union Station.

I have watched the operation of State patrol systems, where the standard "10" signal system is used, such as 10-19 "Return to your station," 10-21 "Call this station by telephone."

Such operating is fast and adequate for some services. I have seen one State Forest Service organization try it—men were always looking up a number to get the meaning. I do not believe it practical for our use considering the variations in message texts, and personnel. Our operating should and can be made faster and more "business-like" in most instances. As a suggested method, I will give you quickly a few samples from the R-8 Handbook. It is not perfect but will serve to illustrate the idea.

(Show R-8 Handbook, pages 9-10-11)

The second part of the operating section should give the operator all he needs to know to set up and operate the transmitter and receiver. For some sets this will be very simple; for others, more complicated. I am a firm believer in plenty of illustrations for this section. This, I have learned by experience, is needed; at least in R-8. A sample of type of Manual is the R-8 "T" set manual which I have discussed.

Standard Nomenclature List

This subject is one upon which there will be many ideas, and much discussion. Certainly, there are many systems in use now by the Army, commercial companies, and the Forest Service. For subject matter, I studied the system in use by the Army, two commercial companies, and our present nomenclature list. I came to the conclusion that there can be no really simple nomenclature for both the technical and nontechnical man--it must be a combination for the use of both. Basically, it should include a general description of the set for the nontechnical and a combination of letters and numbers which will give the technical man the needed information. This will result in a revision, to some extent, of the present system.

I realize that if we speak of an "SX" set, a "T" set, or a "KU" set, this can be confusing to the average Forester. There seems to be no reason why the nontechnical man cannot just as well refer to the "FM handy talkie," the "two-channel FM mobile transmitter or receiver," the FM or AM lookout equipment. There seems little more reason for the average Forester to memorize radio type designations than to memorize the manufacturer's model data of automotive or tractor equipment. If he wants a complete description of the equipment, together with the model or type numbers, he can always refer to that section of the Handbook which contains this information, as suggested for part A of the Handbook. Let us look at a typical example of the method used by the Army, as taken from one of their publications.

A set was given this designation: BC-625(A) Sig-AN-VRC-1. Several minutes later, after referring to another publication, I found this to be an FM transmitter and receiver, for mobile use, powered by either dry or storage battery or 6 - 12 or 24 volts, frequency range 27 to 40 megacycles. Even the Army section which developed this list has a complicated division name, this being: "The Nomenclature Sub-section, Security and Nomenclature Section, Maintenance and Specifications Branch, Technical Coordination Division, Engineering and Technical Service, Signal Corps, War Department"!!!!

I next turned to the nomenclature used by two commercial companies and found them less complicated and more in line with that we now use and they come much closer to fitting our needs.

For example, 50-UFS-ED-7A was the number given to a 50-watt, FM set, for fixed station use in the 30 - 40 MC range. The addition 7 means that this is the seventh model or revision of this type.

For Forest Service use, I suggest the following basic letters and numerals for identifying equipment, together with a word description:

M - Mobile
 F - Portable
 HT - Handy-Talkie
 FS - Fixed Station
 AC - Aircraft

F - Frequency Modulation

A - Amplitude Modulation

Ed- Followed by number for model, as Ed-3 for the third revision or model of the set.

B - 30 - 40 MC

C - 170 MC

D - 3 - 4 MC

T - Followed by a numeral to indicate transmitter channels, such as T-5.

R - Followed by a numeral to indicate receiver channels, such as R-4.

6 - Storage battery voltage

DY- Dry battery operated

/ Slanting line to indicate "part of or used with" when the set is in 2 or more parts.

Transmitter power - Listed in word description or with transmitter data.

Let us see how this would work in practice.

For example, we would have: 35-MF-6-Ed-1-B - Mobile, frequency modulated transmitter and receiver - Model #1, 30 - 40 megacycle range, for operation from a 6-volt storage battery, for two-way service; or

AC-F-12 - Tr/R-2-B-Ed-1 - Aircraft, frequency modulated transmitter and receiver - Model #1, 30 - 40 megacycle range, for operation from a 12-volt storage battery, for two-way service.

If the complete set is packaged in one cabinet as the new FM mobile set is, one set of numerals and letters will be sufficient. If the set has a separate transmitter and receiver, the transmitter and receiver will each need a number for reference when separated.

No doubt it will not be found practical to change the designation of AM equipment such as the M, SPF, I, T, and SX which is all amplitude modulated. If this is the case, it may not be necessary to indicate that the new sets are Frequency Modulated. This would eliminate the A and F indicating the type of modulation.

I will not attempt to give the nomenclature for all the sets, as I think the two examples given illustrate the suggestion. The idea is applicable to remote control units or any other type of gear which is developed. This system will necessitate referring to a nomenclature code list, or memorizing, as no doubt the technicians will do.

This system may not be as simple as some will want; however, at the moment I do not see how it can be made much simpler and yet give both the technical

and nontechnical man what they want. It will give the administrative man a clear word description of the set, in addition to the technical data needed for complete identification.

In closing, may I say that I realize that conditions in some Regions may make some changes advisable in certain standards, such as installations or operating procedure, and, in such cases, the Region concerned should issue supplements to cover their conditions. However, the Handbook should be the basic standard for what I think should be a usable tool.

Topic No. 6FOREST SERVICE PROBLEMS OF EQUIPMENT STANDARDIZATION,
INCLUDING AIRCRAFT RADIO

By Harold K. Lawson

Insofar as the Radio Laboratory is concerned, the problem of Forest Service radio equipment standardization narrows down to lack of an adequate pipe line from field to Laboratory.

One should certainly not jump to the conclusion that such a pipe line can consist only of a greater number of field contacts by Laboratory personnel or of recurrent consolidation of statements of field needs secured through correspondence. Both of these have been tried to a sufficient extent to know that they leave much to be desired.

Field contacts by Laboratory personnel have only served to confirm the wide divergence between Regions as to what each Region thinks it must have in the line of communication equipment and communication systems to meet its individual needs. This individualism was amusingly illustrated recently when one Region stated that it favored equipment standardization "to meet the Region's needs."

I could quote a long series of examples of individual Regional equipment requirements which have reached the Laboratory, all of which are specialized demands of a single Region only.

The building of an equipment project program on a Service-wide basis from such a starting point is, to say the least, difficult.

Only by consolidating the requirements of the various Regions at a point which is vested with sufficient authority to make firm and final decisions (many of which are basic in organizational relations) can the present weak system be improved. Even this cannot be accomplished until a better set of guide lines are established for communication planning and are adhered to on a Service-wide basis.

There are several very important factors, some of which reach outside actual communication work, that now contribute to the lack of consistency in approach to similar communication problems in the various Regions.

1. Lack of a sound and basic all-Service communication program to serve as a framework within which Regional communication systems can be planned and activated with a reasonable degree of consistency between the Regions.

This all-Service approach should take into account such fundamental points as evaluation of Communications in relation to the field or administrative functions which these communications are to serve. Even a rough measuring stick applied at this point would help to put communication facilities into balance with actual needs and would minimize the present situation of overdoing the job at one point and seriously neglecting it at some other very

important place—it would substitute fact for personal preference or prejudice.

Measuring sticks for desirable or necessary quality, quantity, and kind of communication for various jobs and under various conditions are also critically needed. None of these units of measure can be inflexible or precise—however, this is only because all of the facts are not at hand or are not precise with respect to the jobs that communications must fulfill.

2. Lack of interest and understanding on the part of administrative officers. This is not meant to imply that the administrative officer should be concerned with the purely technical phases of communication. He should, however, take the time to become sufficiently well informed to realize when he is being sold a "bill of goods" by a technician. And, conversely, he should realize the limitations of his own technical knowledge of communications and not attempt to dictate the "how to do it," but rather to merely accept or reject the technical phases of a communication program on the basis of actual need and ability to finance.

This lack of interest and understanding now result in much low-grade communication planning or the almost complete lack of true integration of communication planning into the plans of major Regional divisions. What I have in mind is the all too common situation where plans for field activities, which depend almost entirely on communication for their successful operation, are made in their entirety without thorough consideration of how the needed communication is to be secured, or at least without consulting the communication officer as to the feasibility of implementing the proposal.

It is not uncommon to find that completed plans are thrown out of gear because communication of the required quantity and quality cannot be established by the deadline date set up in the plans or that quality must be seriously sacrificed in order to stay within financial limitations and yet spread communication over the area called for in the plan.

If we are to have reliable and economical communication when and where it is needed, we must integrate communication into plans and not merely append it to them as an afterthought.

3. Wide variation in fire control practices, primarily those that pertain to dispatching methods and the location of dispatchers and heavy equipment; the need for intra-Forest and inter-Forest communication; the centralization of fire and other communication; and the use, extent, and centralization of air to ground communication.

Certain of these problems are magnified by lack of a Service-wide communication planning guide.

4. "Personalized" planning in place of planning which is shared by major Regional divisions.

Practically all paper plans which I have seen indicate divisional concurrence through signatures of divisional chiefs, but it is extremely doubtful that such plans have received more than a brief and hurried reading by the administrator. The form of the plan is usually responsible for this. Most so-called plans combine both the objective steps and the technical and activation processes into one confused mess with decibels interspersed with where, why, and how many dollars.

5. Lack of centralized authority on communication matters with power to decide and to act.

Returning once more to the field-to-Laboratory pipe line of information--- there is need for a coordination group (a little IRAC) who will consolidate Regional communication problems and equipment needs and interpret these in a program of work, to be approved by the Chief, for the guidance of the Washington Office Communication Officer and the Laboratory.

Such a coordination program would concern itself with general, but not detailed, specifications for both commercial and Forest Service types of telephone and radio equipment.

There is immediate need for just this sort of thing to determine the course to be followed by the Radio Laboratory in providing radio communication equipment for Forest Service and contract aircraft.

The problem is not merely one of deciding the most desirable size and weight features of the equipment but it also involves some very basic factors and questions such as:

1. The minimum reliable communication range which will be acceptable.
2. Whether or not Forest Service air to ground communication must be capable of tying an aircraft in flight in any part of a Region to a single central control station or whether less ambitious central control with a greater number of ground contact points is acceptable.
3. The established ground system into which the aircraft must communicate or consideration of a special ground network specifically for aircraft.
4. The frequencies to be employed in light of answers to the foregoing questions as well as those frequencies required for navigation and flying aids.
5. Consolidation of all factors in an effort to simplify, secure maximum reliability, maximum safety, and minimum weight of communication equipment in the airplane.

Topic No. 7 (Item 1)COMMUNICATIONS FINANCING

By James C. Iler

In considering the financial aspects and problems in the communications field, we should be clear at the outset that the following discussions are of an exploratory nature rather than the result of sound analyses. The structure and composition of the Forest Service budget is complex and, in some particulars, quite restrictive, consequently we must carefully program our needs and proceed with purchases of communications facilities and services in an orderly way and on a basis that will properly distribute costs to the several participating appropriations and functions. In order to properly consider the financing job, it is necessary to include some discussion on organization and plans. Hence, this topic overlaps some of the other topics to some extent.

To facilitate discussion, Topic No. 7 has been broken down as follows:

- A. Planning--scope--timing--personnel.
 - B. Action program--cost--timing--personnel.
 - 1. Construction program.
 - 2. Maintenance program.
 - C. Equipment purchase.
 - 1. Specialized items--controls.
 - 2. Stock or standard items--controls.
 - D. Allocation of funds.
- A. Planning. The findings and recommendations of this conference must be acted upon with dispatch and governing policy and guidelines given the field at the earliest possible date. This action will permit each Region to complete communication plans promptly, intelligently, and with assurance that the respective systems will not conflict with their neighbors.

In Region 1 we think the detailed planning job can best be headed up by our communications officer under the guidance of the Division of Operation in accordance with the pattern of organization established by the Chief. We think that each plan should be carefully reviewed by the resource divisions primarily interested in communications. The communication officer's salary should be provided for in the regular base. He may need special assistance for a year or so in order to complete the planning or rather replanning job within the next 2 years. We would prefer to finance this help in the regular budget, but will in all probability be forced to use Fire Control and communications maintenance funds. As fast as we can get to them, each forest should be scheduled and requested to assemble preliminary planning data including an analysis setting forth in detail communication requirements for each ranger district. The Regional communications officer should meet with the supervisor or his staff officer and each district ranger. These meetings should result in a meeting

of minds on communications needs and the recording for pertinent planning data. The communications officer should prepare a preliminary plan from these data and discuss it with interested Regional divisions and with the forest supervisor. The comments resulting from these reviews or discussions should permit the final preparation of the communication plan. No special funds should be required by the forests for their share in the plan. It is essential that the plan properly reflect the use of grounded and metallic forest-owned telephone lines, radio nets, and commercial facilities. We should not continue to own and operate telephone lines used extensively by local residents or business firms, but rather should strive to sell such lines to telephone companies and thus get out and stay out of the telephone business. Radio nets will undoubtedly replace certain portions of our telephone systems. Where this is the case, such lines should be disposed of promptly by sale, or salvage. The plan for each ranger district should take cognizance of this requirement.

- B. Action Program--Construction. Apparently our plans are not far enough along to permit the preparation of firm estimates of construction needs. The expansion of power transmission lines has upset many of our telephone lines and no doubt will upset more of them. However, despite uncertainties and lack of knowledge we know the job facing us is expensive and that funds are not available now to do the things that should be done. Each Region has, no doubt, roughly set out the amount of new telephone line needed and the mileage that should be reconstructed in their project work inventories. I do not know what these totals are, but they must be sizable. Mr. Duvendack gave me a rough tab that shows our radio needs total approximately \$1,700,000 plus the amount needed by Region 5. Anyone familiar with the financial problems now confronting us in virtually all activities can readily see that satisfactory progress on our communication needs is impossible. The best we can hope for is to get by without any damaging breakdowns until adequate financing can be secured. There are, however, certain constructive steps that can be taken. We can make the plans mentioned above and should do so at the earliest possible date. With the knowledge and understanding gained through these plans we can schedule the abandonment of expensive telephone lines where radio will do the job required at less cost. We can force savings in our telephone maintenance funds to be applied to the reconstruction of essential telephone lines and for the purchase of radio equipment. We can budget from Fire Control equipment funds nominal sums for the purchase of radio equipment. These sums must be clearly justified from a Fire Control standpoint. In like manner we can budget radio purchase funds from other accounts such as BRC and FRD when BRC and FRD crews actually use radio equipment. Past experience indicates that occasionally unforeseen savings materialize and that windfalls sometimes occur. Full advantage, of course, should be taken if the future holds similar pleasant surprises. A hard-driving coordinated procurement program based on sound communications plans should at least permit us to stay even and might, if we

are fortunate, permit us to get ahead a little where we can turn to radio. I see no hope, within our present budget structure, to reconstruct major metallic telephone circuits.

Action Program—Maintenance. Telephone maintenance is becoming increasingly expensive. Maintenance deferred during the war is a major item. Pole line maintenance has a way of creeping up on us. Technical problems are resulting from expanding power circuits and an increasing mileage of metallic circuits. Generally speaking, however, telephone lines can be maintained in reasonably good condition by district crews with only occasional assistance by technicians.

Radio maintenance on the other hand requires technical assistants. Due to the fact that we use specialized equipment, we cannot expect satisfactory results from amateurs. Even professional radio repairmen must be conversant with our equipment before they can satisfactorily repair and adjust it. This means that we must either employ radio technicians or make satisfactory arrangements with local stable professional radio repairmen. Light radio Regions may be able to get along with only a part-time radioman if good arrangements can be made with responsible local radio firms. Heavy radio Regions will probably be money ahead to employ radio technicians. When this is done, quite probably best results can be achieved through decentralization with the technicians assigned to the forests rather than grouped in the Regional office. Under this plan each technician would work for one supervisor even though he might work on several forests. A satisfactory work plan is feasible under these conditions and a modicum of cooperation between the interested supervisors will insure success of this plan. The salaries and travel expenses of radio technicians must be budgeted and paid from Fire Control, project funds, and communication maintenance funds.

- C. Equipment Purchase—Specialized Items. No doubt the Forest Service will of necessity continue to develop and use specialized radio equipment. Without question equipment of this kind can best be procured through central purchase, supervised and directed by the radio laboratory. It is recommended that, as soon as specialized items are perfected and stabilized and we are reasonably certain that satisfactory commercial items of a similar nature will not be manufactured in the immediate future, we set up a revolving fund to purchase a stock pile of such equipment. This procedure plus one consolidated order will permit aggressive purchasing by the Regions and thus enable full use of any sums large or small and overcome the disadvantage of depending entirely on firm long-range orders.

Equipment Purchase—Standard Items. Care should be exercised to spread our radio business where this can be done without financial disadvantage to the Government. Standard items, including parts and service equipment, should be purchased locally by the respective Regions when they are equipped to handle such purchases. Control by the Chief probably through the radio laboratory is essential, but guidelines plus inspection should suffice even though considerable procurement authority is delegated to the Regions.

- D. Allocation of Funds. It is understood that the Chief is currently allotting communication maintenance funds on the basis of the F.Y. 1946 Volume of Business Statement submitted in response to Circular O. No. 339 of August 24, 1945, and apportioning funds on the miles of metallic and grounded telephone lines reported therein. Thus no cognizance is taken of radio equipment and each Region will receive the same proportion regardless of how many miles of telephone lines they roll up as long as this formula is used. This formula seems fair and equitable and it is recommended that its use be continued for at least the next 5 years.

Topic No. 7 (Item 2)RADIO MAINTENANCE BY FOREST SERVICE TECHNICIANS

By Guy V. Wood

The following paper covers: (1) Our concept of the radio maintenance problem and (2) a method of radio maintenance by Forest Service radio technicians (repairmen) as has been actually practiced in Region 5.

We feel our present approach to the radio maintenance problem fulfills the fundamental technical requirements necessary to provide, as near as possible, reliable radio communication with the equipment on hand. However, it may not be the exact plan we will follow in the future. Modern equipment design and techniques may permit us to modify our present method. We are not going to overlook that possibility.

Whether or not our present approach to the radio maintenance problem is acceptable, either wholly or in a modified form, Service-wide, there are certain basic requirements in equipment installation and maintenance that must be used as a guide. It is not a question of Administrative Officers determining how much maintenance should be provided to give reliable service. The maintenance factor is not variable to fit individual desires. It is variable only to the extent of controlling the degree of communication reliability. To question the actual necessity of maintenance work is not only time-wasting but shows a lack of understanding of the problems of providing reliable radio communications. The basic requirements of providing proper radio maintenance will be brought out later in this paper. Radio was introduced to us sometime prior to 1932. During this period, up to 1942, the use of radio on the forests was more or less haphazard with comparatively little thought along the lines of well-planned V.H.F. networks--equipment being installed in an attempt to meet specific minor communications requirements. Little thought was given to the maintenance problem and technical guidance except in rare instances. As a result, there were repeated equipment failures, improperly used equipment, and attempts to use inadequate equipment to do specific jobs. The result was inevitable. Justly, the field personnel did not feel that such communications filled their actual needs. In fact, it became more or less of a "plaything"--not a planned tool--and often just lay on the shelf. It is true that the art of two-way radiotelephone field communication was only in its infancy at that time and the actual equipment did not approach the reliability that is presently possible. However, these sad experiences by conscientious forest officers left an almost indelible mark that was hard to erase--radio was not for them even though the value of instantaneous communication was paramount in their jobs.

With the advent of World War II, we, along with other Regions, were called upon to help establish the Aircraft Warning Service. In Region 5, the service area covered many parts not served by any type of wire communication which resulted in a concentration of all of our radio equipment adaptable to organized networks to provide the service required. These networks were made to function to a very satisfactory degree. At this time we had a golden opportunity to study the V.H.F. techniques and the possibilities of radio

communication established and worked under technical guidance and with adequate maintenance. It was then fully realized that radio could likewise be made to do the job for the Forest Service with proper equipment, proper placement, adequate maintenance, and guidance in its use.

Upon completion of the Aircraft Warning Service program, immediate steps were taken to revamp, Region-wide, the V.H.F. radio system on each forest with the following steps being taken:

1. As far as possible all unreliable and unstable equipment which had been accumulating was removed from service. We still had to retain a certain amount of equipment which was not considered technically sound, however.
2. A radio communications study was made on each forest and, as a result of this, a basic V.H.F. network plan was designed to provide, as near as possible, for the demands of necessary field communication.
3. All radio equipment having been pooled was reallocated to the forests, to the extent of the inventory, to set up the designed networks and provide field communication. Former frequency assignments were revamped to meet actual inter-forest interference problems.
4. As a direct result of past experience and more recent observations of radio used in the Aircraft Warning Service, a program was launched to obtain a sufficient number of radio repairmen to maintain the equipment in a manner to provide communications. His primary job was to make necessary installations, keep all equipment working, and give "on-the-ground" guidance.

Although this revamping program took over a year of concentrated effort, it produced the desired results fundamentally. The value of properly administered radio communications is no longer questioned. Its place in Fire Control is fully accepted and is used as the basis for plans of action. Radio is now being used to meet the increased job load of forest officers as a result of heavier forest use and to increase the effectiveness of the personnel both as a normal procedure and as a result of shorter work hours.

Those responsible for the electrical operation of this equipment were, and are still, aware that the use demands upon the equipment exceed the capabilities of its original design. We were unable to secure any equipment of modern design to replace obsolete S sets and other somewhat unreliable equipment. Therefore, we have continued to use this equipment even though some of it is over 16 years old. As a result, it has required considerable technical attention—not only preventive maintenance but emergency repairs in the field. In admitting that our present system of V.H.F.—A.M. networks requires abnormal maintenance in meeting the progressive service demands and reliability to which it is subjected, a study of other agencies providing similar service does not show our maintenance program to be entirely unsound or too far out of line.

As stated before, every effort was made to supply the forests with proper guidance. We were successful in being able to "sell" a forest on the idea of having its own repairman in several instances. In other cases, it was deemed advisable to share the man among two or more forests. Shared repairmen, for administrative reasons, were assigned to one particular forest. It was soon evident that the forests being served by these shared men were not getting the desired radio communication results mainly because of the heavy job load and necessary travel as a result of repeated equipment failures plus dissatisfaction among the outlying forests being served and because of favoritism being shown to and demanded by the forest to which the man was administratively assigned.

The value of these men was realized by all forests so, as a natural course, we now have 17 repairmen assigned and serving their respective forests—there being 18 forests in the Region, one of which is not radio-equipped. These men are yearlong SP-7. They are financed 50 percent Fire Control and 50 percent P&M and other funds. The radio repairman job on each forest is as follows:

1. During nonfire seasons, does annual preventive maintenance on all radio equipment.
 - (a) Checks and reconditions equipment housing.
 - (b) Checks all mechanical and electrical components of each piece of equipment and makes repairs and adjustments as required.
2. Properly installs fixed and semiportable equipment—Lookouts, mobile, and other such type installations.
3. Keeps all installations in good electrical condition.
 - (a) Proper antenna installations.
 - (b) Lightning protection, etc.
4. Makes emergency repairs as required.
5. Trains personnel, including seasonal men, in proper operation and care of equipment and its limitations.
6. Makes communication set-ups on going fires and is responsible for their proper operation.
7. Orders proper and necessary supplies to sustain radio equipment operation.

Each forest radio repairman has a service shop at his headquarters equipped with the necessary tools and test equipment to do all normal servicing jobs. He is given technical guidance and help in service procedures and in the procurement of correct replacement parts by the Regional Office. From time to time all of these men are called together for instruction in new service procedures, exchange of ideas, and discussion of the Service aims and problems.

From actual experience during and prior to the A.W.S. program, we obtained a fairly good idea of time and cost elements involved to keep each piece of radio equipment going. This has since been further studied and boiled down into a form by which we can determine, with more or less accuracy, the radio job load on each forest. It is simply a matter of multiplying the quantity of each type of equipment by the man-day index for each piece of equipment on the forest.

Taking the inventory of the radio equipment on each forest multiplied by the man-day index figure shows in most cases, but not all, little more than $\frac{1}{2}$ man-year work on radio alone. However, these men are naturals to do skilled jobs on telephone lines, instruments, switchboards, telephone installation work, telephone line condition surveys, electrical wiring and repair. The men are being used to this full extent. Their work program is full in all cases and the forests deem them as valuable workers. Our most difficult problem in this connection is to keep the men on the track of their primary objective—maintaining radio communications—as there is a tendency through forest administration to load the repairmen with more telephone and electrical work than they can possibly take care of.

While the preceding outline of our approach to the radio maintenance problem may not be the answer with equipment of the future, it is giving, as near as possible, the desired results with our present equipment.

We cannot accurately predict the exact maintenance requirements of future equipment. Surely it will be more reliable and simpler to operate. However, in achieving reliability and operation simplicity, it does not follow that the maintenance problem will vanish, although it may be reduced. Right at the present time, there are efforts under way to tighten up on radio engineering practices as a result of increased use and the resulting crowded conditions within the radio frequency assignments. This means then that our radio communication technical practices will have to be more exacting if we are to win favor with the public in our use of radio. Within the past few years, we have discontinued the use of certain types of radio equipment (noncrystal-controlled sets) in certain areas because continuance of use was not conducive to good public relations. We wish to avoid jeopardizing our right to use radio.

All of this means that the man we do use for maintaining our radio system must be of high caliber. Service techniques may improve but it will not reduce the know-all requirement of the technician-repairman.

It was mentioned in the first part of this paper that there were certain basic controlling factors in meeting the radio maintenance problem. As we see it, they are as follows:

1. Reliability (electrical soundness) of the radio equipment.
2. Quantity of equipment to be maintained as a result of service demands and distribution of this equipment, i.e., service area.
3. Caliber of maintenance personnel, including technical overhead.

Knowing the answer to these three basic factors, the maintenance problem can be met. It is then a question of economic balance dictated by the radio communications demands of the area to be served.

BASIS FOR COMPUTING ESTIMATED ANNUAL RADIO COSTS
AND DETERMINING JOB LOAD

Radio Set Type	TECHNICIAN'S TIME				COSTS				
	Shop M-D	Field M-D	Travel M-D	Total M-D	Mtls. Cost	Labor Cost	Travel Cost	PerDiem Cost	Total Cost
T-D	1.0	.45	1.0	2.45	24.00	28.47	12.00	2.20	66.67
T-E	1.5	.95	2.0	4.45	44.00	51.70	24.00	4.40	124.10
S	.50	.25	.5	.80	7.00	9.30	.60	.11	17.01
SX	.50	.25	.05	.80	9.00	9.30	.60	.11	19.01
SV	.50	.25	.05	.80	9.00	9.30	.60	.11	19.01
HT	.50	.50	-	1.00	9.00	9.30	-	-	18.30
U	.50	.70	.25	1.45	14.00	16.85	3.00	.55	34.40
KU	1.50	1.50	.10	3.10	20.00	40.67	1.00	.22	61.89
Aircraft	1.50	1.50	.10	3.10	20.00	36.00	6.00	6.00	68.00
M	.20	.70	.10	1.00	20.00	11.62	1.60	.22	33.44
SPF	1.00	.60	.05	1.65	15.00	19.17	.60	.11	34.89
I	1.50	1.50	.50	3.50	20.00	40.67	7.00	1.10	68.77
Relay DC	2.00	3.40	3.00	8.40	70.00	97.61	42.00	6.60	216.21
Relay AC	1.00	2.40	1.50	4.90	22.00	56.94	20.00	3.30	102.24
Remote									
Controls	.25	.70	.50	1.45	15.00	16.85	7.00	1.10	39.95
Test									
Equipment	2.00	-	-	2.00	15.00	22.37	-	-	37.37
Office				10.00					
Fire (in-									
cluding									
Guard									
School)				23.00					

EXPLANATIONS:

Shop - Time spent by technician in overhaul and preventive maintenance.

Field - Time spent by technician in setting up and maintaining equipment for operation at regular locations, including prorated time for renewing installations.

Travel - Time spent in travel under "Field."

Mtl. Costs - Batteries, tubes, parts, and prorated amount to cover antenna equipment replacements.

Labor Cost - On SP-7 base salary.

Per Diem Cost - On \$2.20 per day.

Travel Cost - Vehicle rental mileage based on progressive travel. Where pack travel is necessary, double time as shown.

Original Investment - Cost of equipment installed--prewar prices.

Teaching Operators: No time allotted for this in any figures, nor in any figures of this report even though considerable time is spent by the Communications Officer in this manner.

Topic No. 7 (Item 3)OPPORTUNITIES FOR CONTRACTING RADIO MAINTENANCE WORK

By E. M. Karger

The contracting or hiring of radio maintenance work at times becomes necessary to keep communications up to standard. It is obvious that some of the repair work must be farmed out when the amount of work exceeds the capacity of in-Service personnel.

As I see it there are two extremes under which we might contract maintenance service. These extremes are:

1. Cases in which a relatively small amount of help is needed for peak period loads.
2. Cases in which no in-Service technical personnel are available for actual repair work.

Where peak period help only is needed, arrangements may be made with technicians engaged by police or other public radio-using agencies. In such cases it is doubtful if contracts requiring bid could be successful. Public agencies would hardly be interested. Arrangements would best be made directly with the technicians. Arrangements may also be made with local independent radio repairmen. Regardless of who may be engaged to repair or install our radios, it is highly important that the individual's qualifications and ability first be found sound by a competent Forest Service technician. Undoubtedly all the Regions have experienced sad results from the efforts of some tinkerer who was sure he knew how.

When there is a sizable maintenance job to be done and no in-Service technical personnel is available to do it, we have an entirely different problem. I am thinking now of the work required to keep 75 to 100 or more radios going. In such cases large and reputable radio engineering companies may be interested. I know of no other way to present this portion of the topic than through specific example.

Before coming to the meeting I contacted an engineer employee of a concern which sells and services radio. I was led to the engineer because his company had furnished satisfactory maintenance service for the Forestry Department in one of our larger States. In addition to the State Forestry Department the company maintains radio for police, the Army Engineers, taxicab systems, and the Highway Department. According to the engineer whom I contacted, the company is interested in service contracts anywhere in the East, whether or not it furnishes the radio equipment. It is also interested, as I suppose many others are, in bidding on the manufacture of Forest Service designed equipment.

The present contract with the State Forestry Department involves 159 lookout tower and similar installations, 95 portable transmitter receivers, 5 relay stations, 7 mobile receivers, 1 mobile transmitter receiver, 1 control station,

and 1 Kohler generator. This is a total of 266 radio units and 1 generator scattered over a State roughly 300 miles long and 125 miles wide, and containing $15\frac{1}{2}$ million acres of forest land.

Specifications given in the contract are:

1. It shall be clearly understood that the fixed rate charge to be bid by the Contractor will be total and final and that the Commonwealth of _____ will not pay any additional sum over and above the contract price, regardless of the amount of service, whether it be routine or emergency service to be performed, and it shall be clearly understood that the service expected of this communication system shall be equal to the operating standards which the system has performed over its period of operation, namely four (4) years.

2. The Contractor shall furnish all the labor, instruments, suitable truck, furnish and install the necessary parts and make any tests, adjustments, and repairs as required to properly and satisfactorily maintain the present radio equipment in connection with the Fire and Flood Control Radio Communicating System throughout the State of Pennsylvania for the Department of Forests and Waters. The present equipment is installed in the Fire Towers, Flood Broadcasting Radio Stations, District Foresters' Office, Water Gage Stations, Weather Forecasting Offices, Relay Stations, etc., and is located where hereinafter specified and shown on the accompanying map.

3. The accompanying map shows the Forestry Districts and the locations of the various radio sets involved together with the mileage to give the bidder a more comprehensive idea of the relative location and distance from Harrisburg to the district offices, fire towers, etc. The mileage as shown is by road and is fairly accurate, but does not include detours. The truck must be suitable for transporting the spare parts, testing instruments, panels, etc., without breaking or disturbing the accuracy of same. The Contractor will be subject to call at any time in case of an emergency, all as more definitely described in the proposal.

4. The Contractor shall check frequencies throughout the State in the locations of the radio equipment installations so as to comply with the requirements of the Federal Communications Bureau of any other agency having jurisdiction. The necessary meter will be furnished by the Department.

WORKMANSHIP

5. The Contractor must employ workmen who are thoroughly trained and experienced in this particular scope of work and must show evidence that such workmen are employed before the contract is signed.

REMOVAL OF EQUIPMENT

6. The bidders are also advised that in some districts it becomes necessary to remove the radio equipment from the towers for the winter months,

especially where the towers are not weathertight. However, the equipment is usually removed by the District Foresters but when reinstalled the Contractor must assist the Forester and make the necessary tests and adjustments.

7. Also during the off fire seasons, the radio equipment must be removed from some towers due to unauthorized people entering the towers.

8. This condition exists mostly in District No. 18. The removal and reinstallation of the equipment is done in the same manner as advised in a previous paragraph for towers which are not weathertight.

NEW PARTS

9. All new parts as required shall be new and free from any defects and of the best grade of their particular kind. The new parts must have the same ratings as the parts to be replaced and must be of a reputable manufacture.

Other pertinent points of the Contract Agreement are:

1. The bidder must establish, beyond a reasonable doubt, that he is well qualified to Service, Alter, and Repair the type of radio equipment in use or of a type similar, by certification of past performance.

2. Each bidder must have in his employment at least three licensed servicemen (licensed by the Federal Communications Commission, not less than a second-class type).

The Contractor shall assign one employee to be at the complete disposal of the Department of Forests and Waters with residence or place of business in the immediate vicinity of Harrisburg, with two additional employees available for immediate and emergency service where necessary. This necessity shall be determined by the Department of Forests and Waters.

3. The Contractor must prove, beyond any reason of doubt, his capabilities and experience in the service and maintenance of radio communications systems. The Contractor shall, before bidding, totally familiarize himself with the locations and the equipment to be serviced (installation shown on attached separate copy) so that he may be totally familiar with conditions pertaining to the correct servicing of this system.

4. The Contractor must be totally familiar with the technical intricacies of automatic relaying employed in this communication system. He must, also, have at his disposal a complete stock of spare parts for immediate replacement of defective equipment. It shall be left to the Contractor's option as to whether equipment shall be repaired or replaced, but said equipment shall be satisfactory to the Department of Forests and Waters.

5. The Contractor's directions shall be given by the Chief Forest Fire Warden relative to all forest and protection services and by the Chief Engineer of the Bureau of Waters, Department of Forests and Waters, on all services pertaining to Flood Control equipment, or by their designated assistants.

6. This fixed rate billing shall be all inclusive, including service, maintenance or replacement of all radio component parts which have become defective through natural causes and not through misuse, abuse, fire, theft, or Acts of God. However, the replacement parts for Kohler Generators, gasoline, oil, anti-freeze, radio tubes, batteries and distilled water for batteries will be furnished by the Department of Forests and Waters, and must be installed by the Contractor.

In case commercial electric power is furnished for operation of the relay and power equipment, the Contractor must make the necessary electrical connections to the equipment from a terminal inside the building.

7. The Contractor agrees to render service upon any of the Radio Stations herein listed, of the Pennsylvania Department of Forests and Waters, immediately upon notice by the correct directing officer of the Department of Forests and Waters and that such services are required to complete the same to the satisfaction and approval in every respect of the Department of Forests and Waters. The failure to do so will be sufficient cause for the Commonwealth to declare the contract broken and null and void and further the Department of Forests and Waters will make whatever arrangements may be necessary for the employment of any other person or persons for the rendering of necessary services in the alterations, servicing, or repair of any of the Radio Stations of the Department of Forests and Waters. It is hereby mutually agreed further that should the Contractor fail to render any service or services required and for which it has been notified that this contract shall become ineffective and null and void as to each and every part therein and for any further work that may be necessary during the life of the within agreement. Should the Department of Forests and Waters upon the abrogation of any of the terms of this agreement find itself compelled to employ any other person or persons to do the work that the Contractor has agreed to do by virtue of any emergency that may arise then and in that event the Commonwealth may pay to any other person or persons the cost of the doing of such work and charge to the Contractor any cost, sum or sums over and above the cost, sum or sums that the Contractor would be entitled to under the terms of this agreement and further the Contractor hereby agrees to pay to the Commonwealth any overcharge, excess or additional amount that the Department of Forests and Waters may be bound to pay because of such work being done after a breach of the terms of this contract and further agrees to pay to the Department of Forests and Waters such excess sum or sums over and above the cost which they themselves would have received within a period of thirty (30) days after notice that such excess sum or sums have been paid.

BONDS

Within ten (10) days after award the Contractor shall execute the contract and furnish acceptable bonds as follows: (a) Performance Bond, in the amount of 100 percent of the contract price, (b) Labor and Material Bond, in the amount of 100 percent of the contract price, conditioned that this Contractor will promptly pay for all materials and labor furnished. (c) One Year Maintenance Bond, in the amount of 10 percent of the contract price, effective upon completion and acceptance of the work.

INSPECTION, CHANGES, AND PAYMENT

All work will be subject to inspection and acceptance by the Chief Engineer of the Department of Property and Supplies. The Commonwealth shall have the right to make changes in the quantities and character of the work involved, adjustments of the contract amount to be on the basis of agreed unit price, lump sum price, or Force Account.

Upon completion, final inspection and acceptance of the work, the Contractor will be paid the total amount of the contract, subject to any authorized additions to or deductions from the amount. However, upon request and at the discretion of the Chief Engineer partial payment for incorporated work may be made. An amount equal to ten (10) percent of the value of the work completed will be retained from all partial payments until final payment is made at which time the Contractor shall receive the total unpaid balance. The Contractor shall furnish, if required, a detailed breakdown of the items of work included in the total contract price.

The cost to the State for the service in the current year is \$9,700, or \$37.00 per radio station.

Topic No. 8SAFETY IN THE COMMUNICATION FIELD

By W. B. Apgar

What is safety? There are various definitions which you all know. However, from a Forest Service standpoint, it seems to me that "Safety is what we want everyone to think we believe in 100%, but which we only practice 10 percent."

Most of our trouble can be directly attributed to our stubbornness in accepting advice on how to do our job. The safety officer has one of the hardest jobs in the Service. He comes into the field to help us do a job and yet we frequently classify him as a darn nuisance whose suggestions delay the work and run up additional cost on the job. Our idea is to bust into the work, overcome the difficulties, and complete the job as soon as possible. What if we do take chances; it's all in the day's work and besides we hate to have anyone think that we are scared to take risks. This is the attitude that I have found in the field.

Communications, especially the field end of it, is a hazardous occupation. This is recognized by all the commercial companies. Being a hazardous occupation is not an excuse for lost time accidents but is rather a challenge to cut those accidents to a minimum.

In addition to the damage reckoned in terms of death and crippled bodies, there is also the question of costs and damage claims. Costs can be divided into three parts: (1) Direct cost to the Government; (2) indirect cost to the Region; (3) unofficial accidents involving loss through sick leave.

The Compensation Commission is reimbursed by Congress each year an amount based on accident costs for the preceding year. This is what I refer to as the direct cost, since it comes directly out of the Government budget. The direct cost of all Forest Service accidents for the calendar year 1947 was approximately \$600,000. This money could certainly be used to good advantage in the field.

The indirect cost to Region 1 for 1946 was approximately \$300,000. These costs include plane hire, doctors, smokejumpers, ambulance hire, repairs to equipment, lost time, overhead charges, etc. These indirect costs are approximately four times the direct cost of compensation. Wouldn't this money look good in the field?

Then there are also the unofficial accidents which do not show on the records, but which compel the employee to take sick leave. This not only causes lost time but frequently disrupts work and travel schedules and is directly chargeable to project funds concerned. This can also be translated in terms of dollars and cents. Safety is just as important on unofficial as on official time.

Add all of these costs up and then figure where the money goes. Safety officers never have claimed that all accidents can be avoided but it is well known that 85 percent can be avoided by common-sense safety practices.

Eighty-five percent of the accident costs would make a tidy sum for use in productive field work. I have no figures on what the Service is spending in safety prevention, but certainly a definite amount of this should be spent to eliminate these accidents. There is no question but that safety costs money but accidents can rapidly amount to a far larger figure.

Now let us see what these accidents consist of. First, however, it might be interesting to see what types of accidents are prevalent in commercial work. The Bell System publishes a monthly pamphlet entitled "How Plant Men Are Injured." A compilation of the accidents over a 17-month period totaled 207—what might be termed serious accidents. The percentage by causes is as follows:

	<u>Percent</u>
Pole injuries	25
Tools and equipment	19
Motor vehicles	15
Power line injuries	14
Ladders	13
Miscellaneous	6
Falls	5
Falling objects	3

Forest Service communication hazards can be divided into four major categories:

1. Power line hazards.
2. Telephone accidents.
3. Radio accidents.
4. Lookout tower protection.

1. Power line hazards

These accidents have been low in frequency during the past but with the rapid increase in power line construction, their frequency is due for an increase. This is especially so where we employ joint use construction. Whenever these accidents do occur they stand a good chance of being fatal with resulting high costs.

Region 1 is particularly conscious of this type due to a fatal accident this past summer which killed one man and seriously injured another, who is still in the hospital after 6 months. This accident was caused by pulling a slack telephone line up into an overhead 7,200-volt power circuit. The accident was totally avoidable.

As a result an inspection was made of each of the 1,084 power line crossings in the Region. Of these, 17 percent were unsatisfactory and several constituted a serious hazard. In making this inspection, it was early discovered that the instructions in the Forest Service telephone handbook were terribly inadequate and obsolete. The power and telephone companies were contacted for their specifications and also the State laws pertaining to crossings.

It was found in practically all cases they followed the "National Electrical Safety Code." It is obvious that we must follow the same specifications as the commercial companies if we are to require them to meet our standards. Consequently, the specifications for Region 1 were revised. These instructions were eventually sent to the other Regions as Washington Office K-SAFETY letter of November 13, 1947. These instructions cover the main points in power line crossings but are not complete. They need a great deal more amplification together with detailed diagrams. This should be thoroughly covered in the new telephone handbook.

There are three types of power crossings. First are the high-tension line crossings of from 50,000 to 110,000 volts. Ordinarily these are well constructed and have sufficient clearance so that there is very little trouble from this type.

Secondly, there are the primary lines ranging from 750 to 50,000 volts. The ones that we contact most are the 7,200-volt lines which are commonly used for distribution. This type is the one that is the most dangerous. Insufficient clearance and poor crossing technique are the main troubles. The only remedy is for either the Service or the commercial companies to change their lines so as to accord with the specifications. Joint use on power poles constitutes a big hazard especially where transformers are hung on the poles. Power induction oftentimes is sufficient to give enough shock to jar a climber loose from a pole. It is recommended that rubber gloves be furnished all men who work on joint use poles. Adequate protection should also be installed at crossings, joint use sections, and at instrument installations subject to power hazards.

Third are the secondary service crossings of 110/220 AC current. Ordinarily this amount of power in itself is not fatal but it is dangerous since an unexpected contact may cause a man to fall off a pole. Generally these wires are rubber-covered but insulation deteriorates with time and bare spots on the wire are frequently found. Two feet of clearance is required but this specification is seriously neglected by the companies. Cases have been found where the power drops have even been placed between the telephone wires. The power company should be called upon to remedy these defects.

2. Telephone line hazards

In general this type of accident is not as serious as power line accidents but the frequency rate is far greater. The main type of accidents in Region 1 are those which happen while men are actually engaged in pole work. Falls from trees and poles, due to climbers kicking out or failure to fasten the safety strap properly, are most prevalent. Injury to the eye from wire ends whipping back into the lineman's face is an ever present danger. The number of hazards which can happen on pole work is almost too numerous to list.

These accidents happen to experienced linesmen as well as to the novice. The main remedies are (1) adequate training, (2) good supervision, and (3) proper equipment to work with.

Safety should be made a part of the job and incorporated in all job training. Incidentally the Bell System has an excellent training film on "How to Climb." This film can be obtained for slightly over \$100 and is well worth the money.

The ranger and foreman are directly responsible for safety on the job. And yet how many times have you ever seen a foreman inspect a linesman's equipment. Time after time I have found climbers inadequately sharpened or with spur gaffs that were under the minimum length. Belts and straps are seldom oiled, have bad cracks, cuts, rivets pulled out and the stitching broken. A linesman's life depends on his equipment and it should be the best. Regaffing spurs and making your own belts and straps in order to save a few pennies is poor economy and yet this type of economy is practiced by the Forest Service.

3. Radio hazards

The Region's safety record in radio accidents is 100 percent for which I am duly thankful. Transmitters can give a very dirty bite at times. Even the lowly M set of 25 watts can deliver a kick of 1,000 volts across the transformer and the larger sets will deliver better than 4,000 volts. These sets are potential man-killers and should be handled respectfully. The larger sets are equipped with interlock switches but these are not 100 percent dependable. We have already had an interlock failure on one of the Navy TDF sets. A ruling has been made that a second person must be present whenever a technician goes inside one of these sets. The only remedy for this hazard is the employment of qualified technicians and even then the utmost care should be exercised.

4. Lookout tower protection

Lookout tower protection consists of both the tower protection and telephone protection. The former is directly under the Improvement Engineer but the testing of grounds has been left up to Communications. Cases of lightning injury have been relatively scarce even considering the high lightning hazard of the Region. Here again we don't know when the blow is going to strike and we may have a repetition of the Coeur d'Alene accident at any time.

We have been measuring grounds in Region 1 since 1936 and the lookout grounds vary from 10 ohms to over 3,000 ohms. Most of them are over 500 ohms. Just because we build a nice network of #2 copper wire around the tower and then extend 4 underground wires away from the tower does not constitute a good ground connection or adequate protection. The lightning engineers tell us that a low resistance ground is essential. There is only one way to find out the ground resistance and that is to measure it with a reliable instrument. The Megger instrument has been found to be extremely accurate, rugged, and free from the human factor of error. Ground resistances vary by seasons and years and there is also the factor of loose connections or broken ground wires. I believe that it should be made mandatory to test all lookout grounds at least once every 2 years and to set a maximum of 100 ohms resistance as a standard.

So much for the various types of hazards. Now what are we going to do about it? Are we still going to remain in the 10-percent class or are we really going to do a job of safety?

The following policies are suggested for approval by this conference:

1. Safety instructions should be incorporated with job instructions and specifications and considered essential to every job.
2. The incorporation of essential training and instructions which will enable our employees to accomplish their tasks with skill and safety.
3. Do not assign a man to a job unless he has been adequately instructed and trained in the hazards and safety measures.
4. Personnel should be adequately equipped to do the job.
5. Provision should be made for a properly qualified assistant when doing dangerous work.

When all is said and done, I know of no better way to express safety measures than by quoting this widely adopted slogan:

"No job is so important and
No service is so urgent
That we cannot take time
To perform our work safely."

Topic No. 9PROBLEMS RELATING TO RECRUITMENT, SELECTION,
CLASSIFICATION, AND RATING OF TECHNICAL PERSONNEL

By R. M. Conarro

Recruitment

Up to now, the recruiting of communication technicians has been what could be most easily described as "black market" recruiting. By that term, it is intended to convey the reality that we have not had, and do not have now, a regular recruiting channel available to us.

Communications positions have been filled through in-Service transfer; transfer from other Government agencies, from war-service appointments, from T.P.C.E. appointments, and possibly other temporary and unknown sources. To a limited extent, the Service has been fortunate to have had such liberal sources of employment available. But, on the other hand, those opportunities are now about exhausted, and we still have no policy; no plan. We have drained the bucket dry of qualified in-Service personnel. We have no more emergency work programs through which we may obtain technicians without reference to Civil Service. All, or about all, we have left is T.P.C.E., which is none too helpful, inasmuch as a good technician will not want to accept employment on such terms as T.P.C.E. requires.

For many years, the Forest Service had but little competition in its employment of qualified communications technicians. However, this year (1948) conditions have changed, and the Forest Service has plenty of competition. Most States are now using two-way radio communications, and some States have as many as three such systems. Railroads have entered into this field not as fully as they will, no doubt, in the future; taxicab companies are going all-out with radio; and then we have power and light companies, telephone companies, pipe-line companies, and even motor trucking companies. Yes, the field is open, and technicians are no longer coming a "dime a dozen." They now have a recognized profession; some are organized and know how to submit their demands.

The Forest Service must recognize that the Civil Service Commission holds the answer to many of its recruitment problems. The Civil Service Commission stands both as a barrier and as a helpful agent. As a barrier, it now insists that only temporary assistants can be employed. As a helpful agent, it, no doubt, will gladly prepare and conduct examinations to give the Service recruitment possibilities which do not and have not existed up to now.

It is understood that, before the Civil Service Commission will act, the Forest Service will need to furnish it with job descriptions and grades of the positions for which eligibles are desired. To furnish such information, the various technical and mechanical positions in the communication field will need to be analyzed. This analysis should be on a national basis, preferably made by a selected team of men qualified in job analysis. From the analysis, job specifications could be prepared and submitted to a classification officer for grading, also on a national basis.

In addition, other benefits should be derived from the analysis, such as work-load determinations, establishment of work performance standards, and possibly the establishment of time converting factors.

After the analysis has been made, and job specifications or descriptions furnished the Civil Service Commission, an aggressive campaign should be initiated with the Commission to hold the examinations. When the examinations are announced, the Forest Service should see that they receive the required publicity through prepared news items, and by word of mouth and mail.

Following the examinations, the Forest Service should offer to cooperate with the Civil Service Commission by aiding, if desired, in the task of grading the examination papers. After the completion of this task, regular Civil Service appointment procedure should be followed.

Forest Service communication positions have lost a great deal of their attractiveness. Some of this loss, no doubt, results from working conditions, travel requirements, and some from more attractive jobs coming into the employment picture in recent years. Then, too, new employment in the Forest Service has little to offer a man in the way of security. We now have to tell them: "Here is the job, but we cannot promise that you may retain it; this job is yours only until it can be filled by a person who has qualified with the Civil Service Commission." Of course, we tell them that they will have an advantage by already being employed when examined by the Civil Service Commission. But such statements do not set well, regardless of how tactfully made. The average man is now looking for security in his employment efforts. We can't give or assure that security. In our employment negotiations, the Forest Service has two strikes against it and a cracked bat. We are getting nowhere fast.

We need the help and assistance of the Civil Service Commission. We need the assurance, which we can pass on to applicants, that can be obtained only through the use of a Civil Service register. Applicants are scarce. The forest officers usually find themselves in the position of applicant—that is, applying to men to come to work for the Service.

Of course, there is an alternative to the above proposal to solve our recruitment problem. We can select interested personnel, who have already qualified with the Civil Service Commission, and furnish detailed training to such selectees. Such a step would be costly and loaded with disappointments. It would be time-consuming to those individuals selected for trainers. Other than to catch the exceptional individual, this method is not too highly recommended, but should not be overlooked. Especially if, by our analysis, we can determine that series of grades exist in our communications field which could provide a promotion ladder.

Selection

Under present-day employment conditions, there is not much opportunity to pick and choose. We should not overlook, however, the needed qualifications in our selections. In addition to the necessary technical qualifications,

any man employed in a communications position should have the attributes necessary to maintain his position on a plane equal to or in excess of the recognized standards for other Forest Service work.

In making selections, consideration should be given to the applicant's attitude toward the unusual phases of our work—such as travel, overnight or longer; tower climbing; doing repairs in the field; fire details, and many others.

Classification

Previously in this paper, it was suggested that a job analysis be made of all technical communication positions now in existence or proposed; one of the purposes of the analysis being the assembling of necessary data from which job specifications could be prepared and presented to a classification officer for grading on a national basis. From such specifications and grading, a position series could be developed similar, in principle, to the present Junior Forester series.

Under present systems, or lack of systems, it is entirely possible for a position to be classified in one Region as SP-6 and, in another, even though almost identical, as SP-7. Just recently, the Region 8 classification officer insisted on placing these technical positions in the CPC series. However, as yet it has not been done. The classification act provides certain basic rules which must be followed in its administration; one of these being the job specification requirements.

The preparation of job specifications should be taken out of the "hit or miss" class and placed on a solid foundation. They must be such that they cannot be changed for convenience in adjusting the grade of an individual for promotion or demotion. They should be above the power to change because of the whim or fancy of a local classification officer, and they should reflect the national picture. Technical positions do not vary by Regions sufficiently to justify any other than the national scale.

It is believed that such a system of determining classification will result in the development of several grades. This appears desirable in that a number of grades will provide promotion ladders over and above the automatic promotions. It is more than possible that a range of positions will be developed from the CPC through the SP and well into the P grades. Positions in the CPC grade would more than likely include the purely mechanical work necessary to the construction or maintenance of radio or telephone instruments. The SP positions would, perhaps, include those which would require some use of test equipment and some need of individual action. The P grade series would mean just what the letter "P" implies—Professional. By such a breakdown of the technical communications work, we would:

- a. Make our positions more attractive to new employees by providing a promotion ladder.
- b. Make our employees more contented and more willing to stick with the Service.

- c. Make available to all employees knowledge of future employment possibilities--a goal to work toward.
- d. Cause less delay than now occasioned by wrangling with the classification officer about grades.
- e. Make new employment less difficult.
- f. Make for better organization and supervision on a national basis.

There are many other reasons why such a system would contribute to better service.

Before leaving this part of Topic 9, it should be understood that the classification system, as now in use, should provide many of the above-listed benefits. The only difference, at least as it is now viewed, is the lack of the job analysis and job specifications prepared therefrom on a national basis. That is the important step which should be taken, and taken promptly.

Rating of Technical Personnel

The efficiency rating of an employee is a task which must be taken seriously by the rating officer. In order for him to be fair, both to the employee and to the Service, it is necessary that he have rating standards or elements available. He must have the best knowledge attainable on work accomplishments, work loads, performance standards, and job specifications; as well as knowledge of the employee's work attitude, interest, industry, and many other things to be considered.

Ratings when made, regardless of where the rating officer and employee are located, should be comparable to the rating given another employee, even though in a different Region. Technical communications position rating should be on a national basis. Under the present system, this cannot be accomplished because of different job specifications for the same grade and the absence of national work performance standards. These two items would confuse any effort which might be made to rate one technician against another.

Since the early thirties, the Regional communications organizations have increased many fold. The organizations have emerged from the embryo stage. It is doubtful that their management has recognized this change fully; there is plenty of evidence that it has not. The importance of such an organization must be recognized; it must be placed, at least from a management viewpoint, on a par with other organization units in the Service. Par cannot be obtained until the whole field of Forest Service technical communication has been explored. Then, and then only, will the communications organization be lifted up to where its acts can be recognized by efficiency ratings based upon standards and specifications.

The analysis thread has been woven into all four sections of this paper. There was no way to avoid it. Analysis must be recognized as a tool by which recruitment, selection, classification, and efficiency ratings all can be accomplished on a fair and impartial national basis.

Topic No. 10HOW TO MEET THE PROBLEMS CONFRONTING THE FOREST SERVICE
IN MAINTAINING A PROPERLY BALANCED TELEPHONE SYSTEM

By William S. Williams

This subject ties in very closely with Topic No. 2 and a part of Topic No. 1. And it assumes that we already have a telephone system of some kind. It may be that the present system is inadequate to handle our requirements, or it could possibly be that changed conditions would warrant the elimination of some of our present lines to keep the system in balance.

In either case, the first step to be taken in meeting the problem of maintaining a balanced system is to set up definite principles to be used as a guide. The same set of principles or rules will not necessarily apply in all Regions. In fact, they may not even apply to the same extent on all forests within a Region. The governing factor in setting up the rules and guides to be followed is usually the Fire Control standards and methods that have been adopted for given areas. The discovery time, report time, and get-away time allowed in fire suppression are important factors to be considered. Another big factor in our Region is the dispatching system employed on a forest. A full central dispatching system set-up is one thing, decentralized dispatching is another, insofar as a communications system is concerned.

After the principles have been determined and agreed upon, the next step to be taken is to go on each forest and evaluate and appraise the telephone system as it presently exists. This study should include commercial facilities as well as our own.

The job should be started by classifying all lines by types; that is, by metallic or ground circuits and whether trees or poles. This information should be shown graphically on a map. A written inventory should be prepared at the same time, showing the mileages of each lead separately by types of lines. This inventory should also show the number of telephones, switchboards, underground power line crossings, etc., that affect ultimate maintenance charges.

With this information plus the guides set up under Topic No. 2, we should be in position to work out a balanced telephone plan for a forest. In working out a plan, we must be careful not to be unduly influenced by the presence of an already existing Forest Service line or system. For instance, even though we now have a 25-mile circuit between a Ranger's headquarters and a Supervisor's office where commercial facilities also exist, it may develop that a 50-cent toll charge will prove less expensive than the continued maintenance of our own lead. On the other hand, even though the distance may be short, where connecting line companies and interstate boundaries are involved, the service is sometimes slow and toll charges high.

After making up the complete inventory of our system, we should evaluate the maintenance cost of each lead. Maintenance cost figures cannot be based on what it cost last year to maintain a particular line nor the amount of funds we presently receive. The annual maintenance cost per mile must be based on

its complete replacement, spread over a given number of years. The estimated cost figures should be shown separately by materials and man-days labor per mile for the different types of lines. This evaluation of each line, plus the class of service required, should become our measuring for determining whether or not we are going to keep it or throw it away in favor of radio or commercial facilities.

In making up our final forest plans, I believe the whole telephone system should be classified into about 3 groups or classifications of lines:

First: Those lines that will be eliminated within a year by use of commercial facilities or our present radio equipment.

Second: Those that can be eliminated during the next 2 to 5 years, provided additional radio equipment or commercial facilities are made available.

Third: Those that cannot be disposed of within the foreseeable future.

a. Maintenance Standards

As to the maintenance standards employed, I believe that those that fall into the first classification would, of course, be forgotten, except for rolling them up. Those in the second classification should be kept well insulated and fairly well brushed out. Only temporary local poles or stubs should be used in making pole replacements. Lines that are to be retained indefinitely must be currently maintained to standards set up in the telephone handbook, except where whole sections of poles are in bad condition and funds and labor limited. In this case, it may be necessary to limit pole replacements to every second, third, or even fourth pole until the entire section of line can be brought up to standard.

It seems apparent that the present allotments of regular funds are not sufficient in all cases to even supply required materials. Certainly under such circumstances all labor for maintenance must come from present forest personnel. It is not fundamentally sound to base our standards of maintenance on the basis of funds available nor on the basis of waiting for a gravy train to come along. If we cannot get sufficient funds to maintain what we have, we will just have to reduce the mileage to fit the pocketbook.

b. Power Lines

Since it has been determined that the REA will be responsible to the same extent as privately owned power companies for correcting disturbances caused to our communications system, this problem, in many instances, may now prove a blessing. It can be made to afford us an opportunity to revamp our systems to some extent without a large expenditure of funds. In every case where such construction of power lines is apt to disrupt our existing systems, we should make detailed studies to determine whether or not the system can be converted to radio. Even though power companies or the REA are obligated to build us pole metallic circuits in lieu of ground return circuits, we should,

because of the heavy future maintenance problems involved, take a long-range view of the situation before jumping.

c. Dial Conversions

The impact of dial conversions is something that we will just have to face and deal with as each case comes up. The problem is almost entirely an economic one with commercial companies. Even though we wished to, there is little we can do to stop it. We will have no particular problem in making conversion where we have metallic circuits, except for the purchase of new telephones. For ground return circuits up to 16 miles or so in length, with not more than 10 phones, we can also make conversions with simple and inexpensive equipment. The problem of converting ground circuits of more than 16 miles will have to be handled as individual cases. It may be that, if line leaks can be entirely eliminated and the ground resistance at each phone reduced to zero or thereabouts, its distance can be increased. Further studies on this point should be made.

d. Relinquishing Lines

The opportunities for relinquishing Forest Service lines to other parties are probably few. Our first most likely bet of disposing of them will be to commercial companies having circuits on our poles. In this case, if conditions are such that we can use the commercial services or radio, we can then declare our lines surplus, thus forcing the commercial company to buy our poles and wires. The next bet is to entice some outfit to take over a whole system of ours if it happens to be in a growing locality where they can secure enough subscribers to justify it.

I believe that it should be the policy of the Forest Service not to retain or continue maintenance of any telephone line on which we have no official stations or on which the parties are not definitely obligated or in position to render us active cooperation. We cannot continue to be Santa Claus forever.

e. Carrier Telephones on REA Power Lines

(Brief resumé of talk by Mr. D. A. Riechel, Engineer,
Pacific Telephone & Telegraph Co., Portland, Oreg.)

At the present stage of its development, carrier telephone applied to REA power lines is limited to approximately a 20-mile length of line between ends of the system. With present frequencies assigned for this purpose, as many as 5 channels or circuits with a maximum of 10 customers or phone stations for each circuit are possible. Each subscriber must be located on the power line and have AC power service. The cost of equipment for each telephone station is about \$800.

The important thing in connection with this type of system is that each proposed job must be individually engineered. Stub lines off the main power line and all stubs to customers on the power line not to be a party to the telephone service must be specially treated in order to channel the telephone carrier along its proper paths. This treatment varies widely with each system.

Telephone equipment at the individual stations can be installed and maintained by regular communications personnel. Certain of the devices for treating the power line must be installed and maintained by power company personnel.

In its present state of development it is not possible to extend a carrier telephone system beyond the power line by means of open wire telephone line. Equipment to permit this is under development together with repeater equipment, which may permit the design of systems beyond 20-mile length. When these new equipments are available, there may be considerable opportunity for Forest Service use of this type of a telephone system, but it is felt that in its present state our chances of its use are extremely limited.

Topic No. 11COOPERATIVE RELATIONSHIPS AND HOW TO BEST SERVE
THE STATES' DIVISIONS OF FORESTRY AND OTHER
PROTECTION AGENCIES IN THE COMMUNICATIONS FIELD

By E. M. Karger

As a preliminary to the question of serving the States, I should perhaps first point out that the United States Government through its Forest Service administered Clarke-McNary program is spending 18 million dollars for forest fire control this fiscal year. This money is spent through State forest fire protection agencies. Securing maximum return for each dollar so spent is a definite obligation of the Forest Service.

The question "How to best serve the States" might be answered in as many different ways as there are States cooperating in the Clarke-McNary program. If each State were asked the question, the degree of desired help would perhaps vary from none at all to the type of service we provide for ourselves. Because there is often little uniformity and agreement among or with States, we often take the easiest way out, which is to forget them completely.

Lack of agreement among States and skepticism toward a brother agency which inspects its activities are natural. We in the Forest Service have the same disagreement among our units. Our disagreements may be less severe—but we do have them, from ranger districts on up. To shy away from cooperation or assistance to the States is hardly a proper approach to the conservation problem. Rather, we should seek out points of agreement in individual States and do our utmost to offer service and the benefit of our experience.

It is often difficult to learn specific needed help that States will accept. This topic 11 was briefly discussed at a meeting of Region 7 State Foresters and Fire Control men. One State Forester commended very highly recent technical and administrative help given him through Messrs. Duvendack and Knight. He along with another of the Region's 14 felt the need for a Regional Engineer or technician who might be called upon for help. Two additional States at present without radio would undoubtedly welcome Forest Service help in planning systems and equipment. The States of New York and Rhode Island highly praised Forest Service AM radio equipment. They recommended it to brother States. These two States have commercial as well as Forest Service designed equipment. They feel quite strongly that Forest Service equipment is best suited to their needs. They want to continue its use in the future, adding units as they are able.

New York and Rhode Island along with Delaware, New Hampshire, and Vermont questioned the Forest Service switch to FM. They feel that AM is doing their job adequately.

I was commissioned at the Region 7 State Foresters' meeting to report to them after this communications meeting. Specifically, they wish to know for future planning purposes:

1. Where is the Forest Service heading in its radio program. Will it continue in AM development. Will it continue in securing present models.
2. What are the commercial aspects of AM versus FM. Will AM cease to be available from commercial sources.
3. What is the cost of FM compared to AM for equal service.
4. What about the theoretical advantages of FM. Is there actual advantage.

The very nature of these questions indicates a desire and need for unbiased suggestion. A feeling that the Forest Service can be trusted to give unbiased opinion is indicated here.

Getting back now to the proposition of best serving the States by:

a. The Chief's Office

1. I would suggest continuation of the policy which makes available to the States copies of our handbooks, manuals, etc. This involves advising them what is available and keeping them up to date on new developments.
2. Keep them up to date through the Regions on our laboratory program and policy. Let them know what services and equipment are available through the laboratory or Forest Service procurement.

b. The Laboratory

1. Continue technical assistance on use and maintenance of Forest Service designed equipment.
2. Keep them advised of minor design changes that will benefit the performance of Forest Service equipment owned by the State.
3. Through a news letter or other medium, keep them advised what is going on in the conservation radio field. Invite their contributions to the news letter.
4. Give detailed technical advice as they may call for directly or through administrative channels.

c. Regional administrators and technicians

1. When called upon by the State Forester, make general surveys of State requirements and broadly recommend intensity of system, equipment types, and maintenance organization.

2. Keep check on the services herein suggested, and act in the States' interests so that they may receive the full cooperation of the Forest Service.

3. In communications matters that do not go beyond the scope of the Region, serve in the same general manner as suggested for the Washington Office and laboratory.

4. When the Region itself is not staffed to handle specific State requests, attempt to secure the service for the State through the Chief.

. . .

In all the points suggested in this paper, the Forest Service should lean over backward to give unbiased opinions and service. We must truly recommend that which we feel would best serve conservation in the broad sense, regardless of national-forest practices or equipment.

PROGRAM FOR FM FIELD DAY

Fred W. Biggerstaff, In Charge

All participants to meet at the Radio Laboratory, 340 NE 122d Ave., at 8:30 a.m. Pick-up at the hotels will be made at 8 a.m. by Lab truck and transportation to be requested from Regional Office (pool) by all desiring transportation. Entire group to go to Mount Scott as soon as assembled at the Lab. Short talk and demonstration to be given at Mount Scott (Harold K. Lawson). Group will be divided into four groups: one to stay at Mount Scott, one to go back to Radio Lab, one to go in R-6 communication truck, and the other to go in Lab truck. R-6 truck will go across the interstate bridge and up the Washington side of the Columbia River at least to Bonneville. The Lab truck will go to Government Camp.

Aircraft will leave airport about 10 a.m. and plan about a 2-hour flight, probably circle over Mount Scott and the Lab and then out southeast of Portland.

A handy-talkie will be taken in each one of the trucks and at convenient spots will talk back through the repeater. The other two handy-talkies will be split between Mount Scott and the Lab. Mount Scott will act as control and establish communication with each of the units as it leaves the area, and coordinate communications when necessary during the test. The "ground" equipment consisting of mobile, portable, and handy-talkie may talk together when within range without disturbing the "lookout" equipment by using the portable-mobile channel. Likewise the lookout equipment may be netted without disturbing the ground equipment by using the lookout channel.

NETWORK FOR FM FIELD DAYMOUNT SCOTT

Lookout

CHAN 1 talks to Lookout (34700 kc.)CHAN 2 talks to Portable-Mobile (38832 kc.)
(receives 34700 kc.)RADIO LABORATORY

Lookout

CHAN 1 talks to Lookout (34700 kc.)CHAN 2 talks to Portable-Mobile (38820 kc.)
(receives 34700 kc.; add'l receiver 38820 kc.)AIRCRAFT *

Lookout

CHAN 1 talks to Lookout (34700 kc.)CHAN 2 talks to Portable-Mobile (38820 kc.)
(receives 34700 kc.)MOBILE

Portable-Mobile

CHAN 1 talks to Portable-Mobile (38820 kc.)CHAN 2 talks to Lookout (34700 kc.)
(receives 38820 kc.)HANDY-TALKIE

(Portable-Mobile)

CHAN 1 talks to Portable-Mobile (38820 kc.)CHAN 2 talks to Lookout (34700 kc.)
(receives 38820 kc.)

NOTE: Automatic repeat between Portable and/or Mobile is available on the lookout frequency, CHAN 2, when the Mount Scott equipment is on and set to AUTOMATIC REPEAT.

* Aircraft operate in the net as lookouts and use lookout frequencies.

WASHINGTON OFFICE ACTION

All recommendations approved, except as follows:

Item No. 4. The allocation of both frequency and power for radio use is the prerogative of the Interdepartment Radio Advisory Committee. The proposed Inter-Regional Radio Control Committee (Chief's Office) would only function in the capacity of a board of review on Forest Service applications for frequency and power assignments before they are submitted to IRAC. Present Forest Service policies for radio use are clearly stated and serve as adequate guides in preparing applications to IRAC. Applications for special cases which have controversial aspects (such as the R-1 high-power net) are cleared with the affected regions before they are submitted. Frequencies falling into the "group assignment class," that can be used country-wide, are assigned to the regions on an engineering basis in order to hold interference to a minimum. The proposed Radio Control Committee would unnecessarily delay the processing of applications.

The recommendation is therefore disapproved, but this office will make every effort to obtain regional advice and assistance through regular channels.

Item No. 7. Communication divides naturally into "planning" and "technical service." Planning involves: (a) determination of types of communication required, (b) integration of systems or networks, (c) correlation between units, (d) priorities, (e) scheduling, (f) finance. Technical service involves: (a) determination of technical standards for construction and maintenance, (b) physical job of construction and maintenance.

Application of the principles outlined in the preceding paragraph to the resource level, i.e., ranger district and forest, results in placing of responsibility for "planning" jobs on the administrative officers (ranger-supervisor), and for "service" jobs on the technical (staff) officers (engineering). Carried upward from the forest level through the regional offices to the Washington Office, it would appear that the same pattern should prevail.

In accordance with the approved organization pattern, the Division of Operation is responsible for the functions listed under "planning" and the Division of Engineering for the functions listed under "service." It is apparent, of course, that the "planning" actions cannot be accomplished unless the technical phases are closely integrated with the planning phases.

This item is approved with the following modification: "Communication planning and follow-up action as an activity in the regions should be the responsibility of the Division of Operation, with the Division of Engineering sharing joint responsibility on the technical phases, subject, of course, to final decision by the Regional Forester."

COMMITTEE RECOMMENDATIONSTopics 1 and 2MANAGEMENT'S JOB AND RESPONSIBILITIES;
COMMUNICATION PLANNING

Policy as now written in the Telephone Section, Communications Handbook is sound and adequate.

1. We suggest that this policy be put in the Manual at once and thereby made mandatory on the Regions. Present Manual instructions relative to the use of radio should be brought up to date.
2. We believe effectuation of the policy Service-wide is necessary for the proper integration of all types of communication.
3. We advocate strong leadership in communication work in the Chief's office and believe the first important step has been taken by filling the Communications Officer position. If this officer is to be completely effective, he should be given considerable freedom of action and authority.
4. We recommend the establishment of an Inter-Regional Radio Control Committee in the Chief's office which, through the Chief, will have final authority on the allocation of both frequency and power for radio use. The Committee should have adequate Regional representation.
5. We believe there is need for a strong leadership in communication replanning. Uniformity of methodology is desirable and time saving. The Planning chapter of the Communications Handbook should be accepted as the standard guide. It is suggested that the Chief's office assist the Regions by gathering together samples of forms, methods, etc., which have been used successfully, and circulate the best to the field.
6. We wish to reaffirm that Communication Planning is an administrative job and that communication plans must be integrated with and basically serve to make effective our resource management.
7. Communication Planning and follow-up action as an activity in the Regions should be the responsibility of the Division of Operation, thereby conforming to the organizational pattern of the Chief's office.
8. Communication Planning should ideally begin at the outside of the circle organizationally, i.e., on the ranger districts, and progress inwardly. The needs of the men out in the field should have first consideration in both planning and equipment.
9. Purchase of commercial radio gear should be by the Regions, as they desire, after an O.K. from the Chief as to its suitability and conformance to policy. Forest Service designed radio gear should be purchased through the Radio Laboratory.

10. There is definite need for more data on costs of communication. This includes construction and maintenance costs for both radio and telephone. It is suggested that cost studies on a sample basis be inaugurated in selected Regions. The Chief's office should select the Regions east and west and set up the criteria so uniform results will be obtained.
11. We wish to emphasize the need for aggressive participation on the part of administration in the Regions in the field of Communication Planning, replanning, and organization to carry out the over-all policies. Even with strong leadership in this activity in the Chief's office, progress will not be made unless the Regions participate to the fullest extent of their abilities.
12. A manual revision about the use of radio and the functions of the Radio Laboratory is needed at once. The material on policy in the Communications Handbook should be incorporated in a revision of present instructions in Volume I and placed in a much more appropriate spot in the manual than GA-I7 where now carried.
13. The Laboratory should concentrate on development of radio and allied gear which is not available for purchase from commercial concerns.
14. It should not engage in fundamental radio research or parallel the work of any agency qualified in radio or allied gear development.
15. The Laboratory should act in technical advisory capacity to the Chief's office and the Regions and should not have administrative duties or authority except as specifically delegated by the Chief. In such specific cases, the Region or Agency involved should be informed in writing.
16. The Laboratory should inform the field, at least quarterly, the status of work projects, including its findings about new commercial gear and its possible use.
17. The policy of purchasing proved (field tested) commercial radio equipment whenever possible should be continued.
18. There is need for a closer tie between the Laboratory and the field so a work plan can be made to fill field needs. This work program should be coordinated and approved by the Chief's office. More contacts in the field by the Laboratory personnel are a necessity to achieve such coordination.
19. Administrative officers in the Regions should carefully screen requests for development work before presenting to the Laboratory.
20. The Regions should not embark on developmental or experimental work in radio until given clearance by the Chief.
21. It is suggested that the Laboratory start an investigation of the possibilities and limitations of the 160 - 200 and 400 MC assignments.
22. The Laboratory should proceed aggressively with the job of interesting commercial manufacturers in the production of the Lawson Lightning Arrester.

TOPIC NO. 1(S) F. V. HORTONF. V. Horton, Chairman (R-6)(S) E. M. KARGERE. M. Karger (R-7)(S) R. M. CONARROR. M. Conarro (R-8)(S) M. H. DAVISMayhew H. Davis (R-9)(S) BERNARD A. ANDERSONBernard A. Anderson (R-4)TOPIC NO. 2(S) BERNARD A. ANDERSONBernard A. Anderson, Chairman (R-4)(S) HARVEY O. ROBEHarvey O. Robe (R-2)(S) E. ALLAN LOEWE. Allan Loew (R-6)(S) RICHARD H. LEWISRichard H. Lewis (R-3)(S) W. S. WILLIAMSWm. S. Williams (R-5)

WASHINGTON OFFICE ACTION

The recommendations are approved, with the following comment:

"Most of the commercial mobile sets now being purchased by the Forest Service have a power range of from 30 to 50 watts. Limiting our power to 25 watts in the 30- to 40-mc. bands in effect limits our procurement of mobile 30- to 40-mc. radio equipment to Forest Service-designed equipment. The Interdepartment Radio Advisory Committee (IRAC) does not look with disfavor on 50 watts minimum power in the 30- to 40-mc. bands. This power increase in the VHF (30-40 mc.) bands does not entail interference difficulties comparable in the least degree with such an increase in power in the HF (3-4 mc.) bands."

COMMITTEE RECOMMENDATIONSTopic 3

FREQUENCIES AND POWER ALLOCATIONS

1. We reaffirm the present Forest Service policies on frequency and power allocations as referred to in the Telephone section of the Communications Handbook, page 8.

2. The high-frequency band of frequencies should be reviewed after the Provisional Frequency Board's recommendations have been accepted by the International Telecommunication Union. The purpose of the review will be to make within-Service reassignments of the frequencies we retain and which we may secure so that maximum use and benefits are obtained.

3. Analyze the very-high-frequency assignments now in use to determine probable inter-Regional interference and suitability of present assignments as related to increased use of new FM equipment. From this, affirm or modify present assignment schedule. Action will be taken on this immediately and completed as soon as possible.

4. All group assignments of frequencies above 100 MC now allocated to the Department of Agriculture be assigned to Forest Service for use at any point within the continental United States.

. . . .

Amendment, item 1: V.H.F. power shall be raised from 25 watts to 50 watts.

(S) G. H. DUVENDACK
G. H. Duvendack, Chairman (W.O.)

(S) GUY V. WOOD
Guy V. Wood (R-5)

(S) H. K. LAWSON
H. K. Lawson, Laboratory (R-6)

(S) W. B. APGAR
W. B. Apgar (R-1)

COMMITTEE RECOMMENDATIONSTopic 4INTER-SERVICE EQUIPMENT STANDARDIZATION
AS RELATED TO NATIONAL SECURITY

(Topic 4 was a paper by Mr. Walter H. Campbell,
War Department. See Recommendations, Topic 6.)

WASHINGTON OFFICE ACTION

Committee recommendations are approved.

COMMITTEE RECOMMENDATIONSTopic 5

RADIO SECTION OF THE COMMUNICATIONS HANDBOOK;
STANDARD NOMENCLATURE LIST

The Committee on Topic 5, Radio Section of the Communications Handbook and Standard Nomenclature List, submits the following for final approval:

1. Make the Handbook a usable tool consisting of the following parts and sections:

Part A

General information on policy, organization, frequency, frequency tolerance, output power, advantages AM and FM radio.

Part B

- a. Radio operating and message handling.
- b. Operating instructions for each type of set.

Part C

Technical antenna data.

Part D

Installation standards.

Part E

Service equipment for shop and field use.

Part F

Basic tools for shop and field use.

Part G

Standards of good shop practice.

Part H

Service data for each type of set.

Binding

- a. To be loose-leaf form--and printed in both letter-size and pocket-size sheets.

Revisions

To be made promptly when a new-type set is released or revision made in older model.

2. Standard Nomenclature List:

To consist of a word description of the set, together with a combination of numerals and letters giving the technician the needed description of the set. The symbols and an explanation of their meaning will be listed on a separate page for reference.

. . .

The Committee has thought of how and where this handbook might be produced (although it may not be a part of this Committee's work). It is suggested that this be done by a selected group of administrative men and the Radio Laboratory.

. . .

Amendment

All Regions will mail to Region 8 by February 10, 1948, a copy of all radio operating manuals they may be using. Region 8 will prepare an operating manual for use by the Regions until such time as the Radio Handbook is completely revised.

(S) GAYLORD A. KNIGHT
Gaylord A. Knight, Chairman
(R-8)

(S) NORMAN F. JOHNSTONE
Norman F. Johnstone, R-9

(S) RICHARD H. LEWIS
Richard H. Lewis, R-3

(S) ARTHUR L. TURNER
Arthur L. Turner, R-2

WASHINGTON OFFICE ACTION

Committee recommendations are approved.

Standardization of a Forest Service-designed radio set should not be interpreted to mean that purchase of commercial radios having equal performance is precluded when the price differential and/or delivery time favor the purchasing of commercial equipment. The question of procurement of commercial versus Forest Service-designed radio equipment will be resolved in favor of the equipment which assures adequate performance at the least cost. The Forest Service-designed equipment will be standardized to eliminate minor mechanical and form improvements, with the result that fewer model revisions will be forthcoming. If major mechanical improvements are justified, they will be made in the order of their priority in the over-all laboratory program.

COMMITTEE RECOMMENDATIONSTopic 6EQUIPMENT STANDARDIZATION

It is the opinion of this committee that standardization of the various types of Forest Service designed radio equipment is desirable and should be put into effect.

Immediate adoption of standard radio equipment types is impossible, but it is recommended that such a program be put into effect as rapidly as possible on the following basis:

1. The term "standardization" shall be interpreted to mean stabilization or retention of a type or model of equipment, without mechanical or electrical change, for a period of approximately 5 years. The exact period of time is not to be considered inflexible, but shall be modified in each instance to meet major technological advancements or radical changes in field needs and shall be coordinated with any equipment stocks which may be on hand.
2. After adequate field trial (by the Regions) of each new type of radio equipment developed by the Radio Laboratory in accordance with the approved Laboratory program, such equipment, if acceptable to the Regions, be considered as standard or be modified by the Laboratory to make it acceptable to the Regions.

The principal benefits to be derived from such standardization are:

- a. Increased economies and simplification in procurement.
- b. Increased economies and simplification in field maintenance of equipment.
- c. Increased effectiveness and thoroughness in completion of equipment projects and the testing of new products by the Radio Laboratory before release to the field.
- d. Increased field contacts by Laboratory personnel through relief of the Radio Laboratory from a constant pressure program, which has seen no relief through the life of the Radio Project, with the result that Laboratory personnel has not been able to give needed direct assistance to the field.
- e. Whenever financing permits, the way is opened for central or Regional stocking of radio equipment without chance of loss of such stocks through obsolescence.

In addition to the foregoing, the Committee wishes to comment on the matter of establishing radio equipment project priorities and the plan of work for the Laboratory.

The mere mention of the word "standardization" brings into focus the very serious problem which has confronted the Radio Laboratory in the past of securing a reasonable degree of agreement between Regions as to what specific power, shape, weight, and general form each new piece of radio equipment shall take in order to fill the integrated needs of all Regions.

In view of the reactivation of the Communication Officer's position in the Chief's office, it is felt that the problem may be satisfactorily answered, or at least minimized. If, however, the various Regional radio equipment demands cannot be satisfactorily interpreted into a program of work for the Laboratory through the Service Communication Officer, it is recommended that further consideration be given to an all-Regions committee approach in the form of a "little IRAC" as discussed at this conference.

This Committee also wishes to recommend that immediate action be taken by the Laboratory to carry out its assignment of development or commercial procurement of suitable single channel V.H.F. (FM) radio equipment primarily designed for temporary installation and use in contract aircraft.

(S) H. K. LAWSON

H. K. Lawson (Radio Lab.), Chairman
(R-6)

(S) HARVEY O. ROBE

Harvey O. Robe (R-2)

(S) B. A. ANDERSON

B. A. Anderson (R-4)

(S) FRANCIS W. WOODS

Francis W. Woods (R-4)

(S) M. H. DAVIS

Mayhew H. Davis (R-9)

WASHINGTON OFFICE ACTION

The committee's recommendations are approved with the following comments or modifications:

Item 3. Every effort has been and will continue to be made to present a clear picture to the Appropriations Committee of our requirements for funds to adequately maintain all of our improvements. The regions should have a fresh look at their distribution plan for improvement maintenance funds. Are telephone maintenance funds allocated on the basis of their relative importance compared with funds for fences, buildings, etc.?

Item 4b. The committee's wording is in conflict with the policy on communication facility maintenance. The conference adopted the recommendations of the committee on Topics 1 and 2, which contained the statement, "Policy as now written in the Telephone Section of the Communications Handbook is sound and adequate."

We concur with the minority report suggestion that the following wording be substituted for the committee's wording, thereby harmonizing the adopted policy and the recommendations of Committees 1, 2, and 7: "Any communication facility, the retention of which is justified, should be so maintained as to insure adequate and reliable service."

Item 4c. The hiatus wherein we have a communication plant which is generally deteriorating for lack of adequate financing will be solved by the employment of the following measures when applicable:

1. Disposal of the following portions of our telephone system:

(a) Forest Service lines paralleling commercial circuits when the service which can be commercially purchased is adequate.

(b) Forest Service lines which are commercial in nature should be disposed of if adequate service after disposal can be secured.

(c) Abandonment of lines which duplicate service. One properly constructed and maintained line assures more reliable service than two lines which are poorly constructed and partially maintained.

(d) Abandonment of long, expensive-to-maintain back-country lines and substitution of adequate radio when there is a financial advantage.

- (e) Placing of lines under Special Use Permit to Associations of Cooperators when the traffic which the line handles for co-operators exceeds Government traffic. The quality of resultant service must be weighed against the justifiable quality of service demanded and the savings involved.
2. Taking full advantage of appropriate contributed-time opportunities for maintenance work.
 3. When telephone maintenance funds are inadequate, other program or project funds may be utilized in proportion to their relative need for communication service, and in accordance with established financial management practice.
 4. Striving constantly to secure just and equitable settlements with power companies, REA Cooperatives, and telephone companies converting to dial systems.

Item 5 has been the source of much irritation. Service-designed radio equipment will be centrally procured through the Radio Laboratory. Service charges by Region 6 Central Purchase Unit are presently under study and you will be advised as to outcome.

Item 6. Regions will clear with the laboratory all contemplated purchases of standard commercial communications equipment. The wide experience of the laboratory staff will be utilized to fullest advantage, thereby assuring: first, that only suitable equipment is purchased; second, that experimentation or field testing of various equipment is confined directly to the laboratory; and third, that the best possible specifications are prepared.

COMMITTEE RECOMMENDATIONSTopic 7COMMUNICATIONS FINANCING;
RADIO MAINTENANCE BY FOREST SERVICE TECHNICIANS

Recommendations for Topic 7, Finances:

1. We feel that the best base for apportioning communications funds now existing is the miles of grounded and metallic telephone lines as reported in the volumes-of-business statement submitted by each Region in response to circular O. No. 339 dated August 24, 1945. This base should be used for the next few years or until a better base is developed from revised communications plans or other equally sound data.
2. Separate allotments for communications plans or equipment purchase should not be made by the Chief. Each Region should be permitted to retain a maximum of freedom to establish Regional programs and determine financial requirements. These actions, of course, should be taken in accordance with policy and guidelines prescribed by the Chief.
3. We believe that resource management communication requirements are appreciably above available finances. Every effort should be made to secure increased finances at the earliest possible date.
4. The following actions should be taken to guard against serious breakdown in our communication plants:
 - a. Telephone lines now surplus to present-day needs or which can be replaced by radio at less cost should be disposed of at once or placed on a restricted maintenance basis until they can be disposed of.
 - b. Other maintenance should be curtailed to the lowest level consistent with Service requirements and to prevent further deterioration of existing facilities.
 - c. Fire Control, Road, Blister Rust Control, and similar funds should be levied against to the extent justified by their several special communications requirements.
 - d. These actions should produce sufficient funds to permit a limited amount of betterment on essential telephone lines where such betterment is urgently needed and to purchase the basic amount of radio equipment.

5. Specialized communication equipment items such as Service designed radio units should be centrally procured through the Radio Laboratory in cooperation with the Region 6 Central Purchase organization.

6. Purchase authority for standard commercial communication equipment and supplies should be delegated to the Regions. Purchases made under this authority should be in accordance with all-Service guidelines and cleared with the Radio Laboratory where central control is necessary.

7. Savings result when orders for communication equipment are pooled, particularly for custom-built items. It is suggested that consolidated orders be assembled at least each fall. Spring purchases may be desirable for some Regions. Regions maintaining C.P. units can purchase communication equipment in addition to the amount current funds will finance to the extent anticipated savings permit or interested divisions are willing to underwrite. Thus, if current funds permit the purchase of \$20,000 worth of equipment, there is a possibility of a fiscal year balance of \$10,000 and next fiscal year funds can be safely committed for \$15,000; the fall order may be increased safely to \$30,000 or \$35,000. Savings would thus be used to good advantage and if they did not materialize, C.P. units would be protected as they would be repaid from regular funds after the turn of the fiscal year.

8. Stock piling large amounts of communication equipment is hazardous because such equipment is still in a "pilot plant stage" and may be subject to considerable modification. We recommend against requesting a loan for this purpose at this time.

. . .

Recommendations for Topic 7, Radio Maintenance by Forest Service Technicians and by Contract:

1. No Region should attempt to install or operate a radio system without technical service. Such service should be available for planning as well as installation and repair work. Both services are imperative.

2. The Regional radio maintenance problems must be met on a technically sound basis dictated by the following:

- a. The reliability (electrical and mechanical soundness) of the radio equipment used.
- b. Quantity of radio equipment to be maintained.
- c. Distribution of radio equipment-service area.
- d. Caliber of maintenance personnel, including technical overhead.

3. Heavy use Regions should provide personnel to handle both phases-- planning and maintenance--of job normally required.

4. For light use Regions or the peak loads of heavy use Regions, contracted or hired assistance may be obtained. Such contractors should be reputable individuals or firms who have been found sound by Forest Service technical personnel. Cost of hired personnel versus contractors should be considered.

(S) JAMES C. ILER
James C. Iler, Chairman (R-1)

(S) GUY V. WOOD
Guy V. Wood, R-5

(S) E. M. KARGER
E. M. Karger, R-7

WASHINGTON OFFICE ACTION

Committee recommendations are approved with the word "shall" substituted for "should" in recommendation No. 2. The importance of thorough inspection and follow-up practices for compliance cannot be overstressed.

COMMITTEE RECOMMENDATIONSTopic 8SAFETY IN THE COMMUNICATION FIELD

The committee on communications safety recommends the following policy statements be adopted by this conference:

1. Management is responsible for planning every job with a full recognition of the hazards to be encountered and for the adoption of safe practices and methods for minimizing these hazards consistent with greatest progress of the work.
2. Safety measures should be incorporated in job and training instructions and considered essential to every job.
3. Physically and mentally qualified personnel will be selected for communication work. Assignment will be contingent on adequate job and safety training.
4. Management is responsible for supplying and maintaining adequate equipment for the job and for supplying a qualified assistant in performing extra hazardous work.

The committee concurs with the safety instructions in the new telephone handbook. When revisions are made it is felt that it would be more effective to have the safety regulations pertaining to each job made a part of that section as well as their present grouping. This procedure is also recommended for the proposed radio handbook.

(S) W. B. APGAR
W. B. Apgar, Chairman (R-1)

(S) GAYLORD A. KNIGHT
Gaylord A. Knight, R-8

(S) ARTHUR L. TURNER
Arthur L. Turner, R-2

(S) NORMAN F. JOHNSTONE
Norman F. Johnstone, R-9

(S) JOHN S. BOWEN
John S. Bowen,
Safety Officer, R-6

WASHINGTON OFFICE ACTION

Committee recommendations are approved.

Undoubtedly the Civil Service Commission will at some time develop standards which will cover the type of communications positions needed by the Forest Service. However, pending the issuance of standards by the Commission, there is nothing to preclude the development of Forest Service standards. This would, of necessity, have to be a joint project by the field and the Washington Office Divisions of Operation and Personnel Management. Consideration will be given to detailing a Regional Communications Section Chief, and a Classification Officer from another region having a fair-sized communications organization, to the Washington Office to assist in the development of standards.

Before such a project is undertaken, the field will be requested to make job-load analyses to determine the types and levels of work involved and other information necessary to determine the organizational pattern that will best fit all needs. The information thus obtained or developed can also be used, at least in part, in the development of the standards.

COMMITTEE RECOMMENDATIONSTopic 9PROBLEMS RELATING TO RECRUITMENT,
SELECTION, CLASSIFICATION, AND RATING
OF TECHNICAL PERSONNEL

The Committee on Topic 9, Recruiting, Selection, Classification, and Rating of Technical Personnel, respectfully submits the following recommendations:

1. That an analysis be made by Regions of the work of Communication Technicians, and how technicians are required or permitted to function. These analyses should be correlated by the Chief, and a uniform organization and classification pattern be developed. From this basic and agreed-upon information, recommendations can be made to the Civil Service Commission for the conduct of the necessary examination and certification of qualified technicians.
2. The making of efficiency ratings for Communication Technicians is the responsibility of the proper administrative officer. He should lean heavily on the Regional Communications Engineer for assistance in rating the technician from a technical standpoint.

(S) R. M. CONARRO
R. M. Conarro, Chairman (R-8)

(S) JAMES C. ILER
James C. Iler (R-1)

(S) H. K. LAWSON
H. K. Lawson (Laboratory (R-6))

WASHINGTON OFFICE ACTION

Committee's recommendations are approved with understanding that every line under consideration for disposal will have to be appraised on:

1. The service rendered to the Forest Service by the line in Forest Service ownership compared to the service that may be expected under other ownership.
2. The amount of savings in maintenance funds after recognizing toll charges that will be made. Consideration should be given to the condition of the line, i.e., does it call for reconstruction money or extra heavy maintenance work within the near future.
3. Determination that through disposal we are solving present cooperator problems and avoiding future problems.

When duplication of wire facilities exists and the commercial or private telephone lines will provide adequate service, our lines should be disposed of by sale, issuance of Special Use Permits, or condemnation and salvage. Cognizance of the danger of going too far in disposal of our lines should be present with Administrative Officers and should guide their proposals and actions.

COMMITTEE RECOMMENDATIONSTopic 10HOW TO MEET THE PROBLEMS CONFRONTING THE FOREST SERVICE
IN MAINTAINING A PROPERLY BALANCED TELEPHONE SYSTEM

In listing the following recommendations, it is first pointed out that much of these details are covered in Topics 1 and 2.

It is recommended that communications systems be reduced to only essential lines by thoroughly replanning, stressing the following guides:

- a. Contact power and telephone companies to determine their plans.
- b. Use commercial lines wherever possible.
- c. Dispose of lines to commercial companies or by special use to private operators.

In replanning the systems, include provisions for classification of lines as to their relative importance and period of use. Available maintenance funds should then be allotted in accordance with these classifications.

Be alert to take advantage of the possibility of rebuilding of Forest Service communications systems in cooperation with power companies wherever power company lines traverse national-forest land and cause conflicts. Consideration should be given to entering into a general agreement with a particular power company covering such rebuilding wherever there will be repeated cases with the same company.

Regarding impact of dial conversions, it is recommended that all information on dial conversions be gathered in advance from local telephone companies. Discuss with the telephone company the problems involved in connecting our lines with their dial exchanges. Point out the possibility of admitting to their exchanges our magneto lines or of providing for rerouting of our traffic by the telephone company to the nearest manual operator.

Regarding Forest Service use of rural power line carrier systems, they do not appear advisable for our use at this time. It is recommended that steps be taken to insure that we watch for new developments which may make their use desirable.

(S) W. S. WILLIAMS
W. S. Williams, Chairman (R-5)

(S) FRANCIS W. WOODS
Francis W. Woods (R-4)

(S) E. ALLAN LOEW
E. Allan Loew (R-6)

(S) W. F. BIGGERSTAFF
W. F. Biggerstaff (R-6)

(S) H. T. HOLMQUIST
H. T. Holmquist (W.O.)

WASHINGTON OFFICE ACTION

Committee recommendations are approved.

As a further aid in strengthening cooperative relationships with the States, S&PF will distribute to the regions sufficient copies of the paper on Topic 11 and the committee recommendation to provide each State forester with them.

Further, Forest Service Communications Officers should take full advantage of all opportunities to learn about the results of any experimental work conducted by the States. This information should be sent to the Chief's Office for appraisal and possible use by the Forest Service.

COMMITTEE RECOMMENDATIONSTopic 11

COOPERATIVE RELATIONSHIPS AND HOW TO BEST SERVE
 THE STATES' DIVISIONS OF FORESTRY AND OTHER
 PROTECTION AGENCIES IN THE COMMUNICATIONS FIELD

The Forest Service stands ready to cooperate with States in communication matters. It recognizes that the States have their Forestry Conservation Communication Association and upon request from State Foresters will assist them directly or through their FCCA in the following manners:

a. Washington Office

1. Continuation of the policy which makes available to the States copies of our own handbooks, manuals, etc. This involves advising them what is available and keeping them up to date on new developments.
2. Through the Regions, keep the States up to date on our laboratory program and policy. Let them know what services and equipment are available through the laboratory or Forest Service procurement.
3. The Chief's communications officer should be available, commensurate with available time, for specific assignments at the request of State Foresters to work with them on their communication problem.

b. Forest Service Laboratory (Portland, Oreg.)

1. Continue to the States technical advice and assistance which can be handled by correspondence or laboratory visits.
2. The States will be furnished with the same information concerning design changes to radio gear as is furnished the National Forests.
3. Transmit to the States copies of the bulletin or special report which has been recommended for the quarterly information of the National Forest Regions. Invite their contributions.

c. Regional Administrators and Technicians

1. Review and make recommendations on all matters of communication planning, equipment selection, and maintenance program as requested by the State Foresters.
2. In communication matters that do not go beyond the scope of the Region, serve in the same general manner as suggested for the Washington Office and the laboratory.

3. When the Region itself is not staffed to handle specific State requests, attempt to secure the service for the State through the Chief.

4. Keep the individual States currently advised concerning major revisions of National Forests communication plans or equipment. In such changes give full consideration to the effects on the State organization.

. . .

All administrative services herein recommended should be channeled through the Division of State and Private Forestry.

(S) E. M. KARGER
E. M. Karger, Chairman (R-7)

(S) G. H. DUVENDACK
George Duvendack (W.O.)

(S) H. K. LAWSON
H. Lawson (R-6)

(S) THOMAS H. BURGESS
T. H. Burgess (R-6)

PROPOSED RADIO-LABORATORY DEVELOPMENT PROGRAM

List of projects in order of naming by floor.	Priority assignments by Regions									
	Regions									
	1	2	3	4	5	6	7	8	9	*
1. Design V.H.F. air- craft radio.	4	4	5	6	4	4	4	4	3	38-4
2. Design V.H.F. pack- sack radio.	5	5	4	5	3	3	3	3	7	38-5
3. Prepare maintenance instructions on handy- talkie, mobile FM, lookout, and station FM sets.	3	2	1	1	2	2	2	2	8	23-2
4. Survey 160 mc. field and develop 160 mc. handy talkie and lookout sets if survey studies warrant.	8	8	12	7	7	5	5	5	5	62-8
5. Design AM and FM radio-telephone ties.	9	9	6	3	5	7	9	10	9	67-9
6. Trips by Laboratory personnel to Regions.	7	7	2	4	-	-	7	7	11	45-6
7. Completion and shake- down of FM equipment already developed.	1	1	3	9	By Nov. 1948	By Oct. 1948	By Oct. 1948	By Oct. 1948	1	19-1
8. Place squelch on control head on mobile sets.	2	3	10	18	1	1	1	1	2	29-3
9. Complete development work on test equip- ment Type A.	10	6	9	2	11	-	8	8	6	60-7
10. Design a portable repeater.	6	10	8	10	6	-	10	9	10	69-10
11. Finish design of Lawson Lightning Arrester, secure a patent.	11	11	7	11	8	6	6	6	4	70-11

* 38-4: 38 = relative weight, 4 = 4th priority.

Projects in order of priority

Estimated completion date and man-days required to complete

1. Completion and shake-down of FM equipment already developed.
 - (a) KF - Mobile. Change squelch control.
 Estimated completion date, February 15, 1948.
 Estimated man-days 5
 - (b) TF - Lookout. Cabinet incomplete--
 internal cabling to be completed.
 Estimated completion date, February 20, 1948.
 Estimated man-days 15
 - (c) SF - Handy-Talkie. Electric design
 completed. Mechanical redesign necessary
 to provide "plug-in" in place of "solder-in"
 tubes. Final case design (cast magnesium or
 similar) to be worked out.
 Estimated completion date, August 1, 1948.
 Estimated man-days 80
2. Maintenance instructions.

 Writing and drafting for KF, TF, and SF sets including
 analysis of inspection sheets to secure point-to-point
 measurement data.
 Estimated completion date, June 1, 1948.
 Estimated man-days 90
3. Place squelch on control head on mobile sets.

 (Est. 2/15/48--5 man-days; see 1(a).)
4. Aircraft V.H.F. radio--design and Laboratory test.

 Estimated completion date, July 1, 1948.
 Estimated man-days 100
5. Packsack V.H.F. radio--design and Laboratory test.

 Estimated completion date, October 1, 1948.
 Estimated man-days 100
6. Trips by Laboratory personnel to Regions.

 Region 3--April; man-days 20
 Others: man-days 40

7. Complete development work on test equipment.

Estimated time, September 1, 1948.

Estimated man-days 50

8. 160 mc. portable and lookout equipment.

Proper approach is to conduct field surveys made with temporary equipment to determine applicability of 160 mc. to general field applications. Actual equipment design would be started only if surveys indicated feasibility.

Estimated time for surveys including preparation of temporary dry cell equipment for use in making surveys, June 1, 1949.

Estimated man-days 100

Design of portable, pack, and lookout equipment for 160 mc. if surveys dictate.

Estimated completion date, December 31, 1949.

Estimated man-days 300

9. Portable repeater—design and Laboratory test.

Estimated completion date, May 1, 1949.

Estimated man-days 60

10. Radio-telephone remote control devices--design and test.

Estimated completion date, October 1, 1949.

Estimated man-days 70

11. Lawson Lightning Arresters. Prepare drawings, secure patent, solicit manufacturing facilities. Prepare installation instructions and diagrams.

Estimated completion date, November 1, 1948.

Estimated man-days 20

12. Re-engineer V.H.F. assignments.

Estimated completion date, March 10, 1948.

Estimated man-days 30

Grand-total man-days 1,080

MINORITY REPORTSTopic No. 3A STUDY OF FREQUENCY AND POWER ALLOCATIONS

Reference is made to the report of the Committee on Topic No. 3 at the recent Communication Conference here in Portland.

The following is a dissenting minority report specifically with regard to floor amendment calling for an increase in the V.H.F. branch to 50 watts maximum power. The Committee's recommendations were for 25 watts maximum power in both the high and very high bands.

Since the beginning of Forest Service use of radio, the fundamental concept has been to use the least power necessary. The frequencies allocated to us have been on this basis. We have group assignments based on this premise. We were committed to a program of low-power portable radio equipment, not duplicating other suitable means of communication.

The Laboratory equipment (New FM) is all 25 watts or less. Provision for 50-watt fixed stations has been made but would require special licensing under the 25-watt limitation. The 35-watt equipment talked about in the conference can very easily be loaded to 25 watts. I think if you increase the power to 50 watts, you will have to be even more restrictive in your bids.

There are other ways of making radio communications more usable. Increasing the sensitivity of receivers accomplishes the same thing as increasing the power of transmitters. Remote installation of receiving antennae away from interference will also help.

I can't see how increasing power can be more than a temporary help. Other outfits will increase their power and then we will have to "see their raise" and so on. Our people will stretch the 50 just as they have the 25 and squawk for more, trying to bull through on power alone when they really should be working to make the lower power function. Low power will serve a very great part of the field need. Technicians always want more power.

It seems to me that if we jeopardize our very valuable group assignments by going to 50 watts, we should stick to the 25-watt limitation. I'm sure the gain to us by going to 50 watts will be more than offset by our loss of the group assignments.

(S) F. V. HORTON

MINORITY REPORTSTopic No. 7, Finances, Item 4, b

Majority report reads: "Other maintenance should be curtailed to the lowest level consistent with Service requirements and to prevent further deterioration of existing facilities."

In the new Telephone Handbook, item 7, page 7, the policy states: "Any communication facility, the retention of which is justified, should be so maintained as to insure adequate and reliable service."

This statement is submitted for consideration as a substitute for 4, b of the majority report. The word "curtailed" is misleading in that little, if any, part of the Forest Service telephone plant is in such physical condition as would permit maintenance curtailment. On the other hand, any communication facility, the retention of which is justified, should, no doubt, receive increased maintenance rather than be curtailed.

May I call to your attention the fact that the group approved Topic No. 1 report without dissent, and that in this report was a recommendation to adopt the policy section of the new handbook and to have it incorporated in the Forest Service Manual. To adopt the majority report of item 7 would be contrary to the group's approval of item No. 1 recommendations.

A copy of this minority report is being furnished Mr. Iler for his information.

(S) R. M. CONARRO

A P P E N D I X

1. General Statement of Policy

(extracted from Forest Service Manual
National Forest Protection and Management)

The communication system on each National Forest unit should be developed and maintained in accordance with plans which are coordinated and consistent with the objectives and standards of both Forest administration and protection. The system should not be "overbuilt", nor should it be "underbuilt", but must be sufficient to fit a planned level of quality, use, and reliability.

Duplication of wire facilities to obtain the same service, where commercial or private telephone lines are available and satisfactory, should not be considered. Point-to-point radio and telephone facilities should not be duplicated to obtain the same service.

Radio has been developed to a satisfactory level of reliability and should, as a rule, be used in lieu of telephone at isolated points and in back country where extensive telephone lines are otherwise needed for seasonal communication only. Very high frequency (VHF) radio will fit well into a local communication system of point-to-point service. Its uses can be greatly increased by remote connections with the telephone system.

It should be understood that under most topographic conditions, very high frequency has real possibility for effective use in small communication networks involving districts and often adjoining forests particularly where a need exists for the use of portable and mobile equipment. Continuous laboratory experimentation and thorough field trials are essential to the realization of full value from this type of equipment.

Responsible officers assigned to administration and protection where effective communications is a vital factor are expected to be alert and responsive to rapidly advancing thought and development in the communications field. The necessity for an open-minded and progressive approach to this important phase of public land management should be clearly evident.

Installation of new radio equipment will be limited to F.M. (Frequency Modulation) gear, except where A.M. (Amplitude Modulation) equipment is necessary to work with an existing A.M. network and such equipment cannot be secured by transfer

from another Forest or Region. All such equipment purchases must be cleared with the Radio Laboratory.

The primary objective of communication planning, construction and maintenance will be to create a stabilized communication system having maximum reliability with a minimum of technical complications. Wherever possible, use radio to lower the initial investment and annual maintenance charge. Sufficient records and data will be maintained of all types of communication facilities used under various conditions to enable responsible officers to make prompt and intelligent decisions whenever additional facilities are proposed for installation.

2. Regional and Forest Communication Organization

(a) Regional Communications Committee

The Regional Foresters will designate either the Division of Engineering or the Division of Operation as being responsible for communications in the Region.

Each Region will maintain a Regional Communications Committee made up of representatives of the principal communication-using Divisions. The representative of the Division responsible for communications will serve as Chairman of this Committee.

The Committee will function as a reviewing body for all communication plans and will recommend such plans to the Regional Forester for acceptance or rejection, based on Region-wide plan coordination, necessity, financing, and consideration of alternative methods. An important phase of the job assigned to this group is to establish and maintain communications planning on a sound long-range basis.

The Forest Supervisor will forward to the Regional Communications Committee all, except strictly temporary, proposals for construction or alterations involving deviations from the approved Forest communication plan. These proposals, together with the communication plan, will be considered and appropriate recommendations made to the Regional Forester.

(b) Regional Communications Officer

Each Region should have a qualified person to serve as its Communications Officer, and he should be assigned to the Division responsible for communication in the Region. This man should be familiar with Forest administrative work and have the necessary technical knowledge of communication systems, both radio and wire. This position should serve as a centralized coordinating point for plan preparation, execution, compliance, and modification.

The occupant of this position will also provide overall technical supervision of telephone construction and maintenance programs and of radio installation, maintenance, and operator training programs. He will also act as the technical advisor to the Regional Communications Committee.

(c) Forest Communications Officer

Those Forests which have sufficient telephone mileage and numbers of radiophones (as determined by job-load analysis) should have a combination telephone-radio technician. It will be the duty of such a technician to correct technical faults and maintain the radio and telephone system, including radio equipment repair, repair and testing of repeat coils, grounds, transpositions, keys, jacks, and plugs on switchboards, lightning protection installations, installations of all instruments, phantom and control circuits, and to make instrument tests to determine line performance and locate line failure and faults. He should also take a leading part in communication planning.

In instances where an individual Forest does not require a full-time technician, one such officer should be assigned to two or more such Forests.

3. Minimum Planning Requirements

Planning of a communication system is essential for economical and satisfactory development and service. Accordingly, no expansions or reductions in the telephone or radio system should be made without coordinating such action with the overall plan and objectives.

Planning should reflect the judgment and experience of Forest personnel and Regional Division Chiefs concerned with use,

maintenance, and financing of the communication system. Its implementation and technical design should be accomplished by an officer competent in this specialized field.

The required minimum elements of communication planning shall include:

- (a) A complete inventory of the existing communication plant in the form of maps supplemented by written material. This will include an accurate record of existing line mileages by types (grounded or metallic);
 - (1) Radio installations; Inventory of Radio installation needs and present use.
 - (2) General condition of pole, wire, instruments, hardware, switchboards, and radio equipment;
 - (3) Contracts and agreements in effect;
 - (4) Pertinent data on other-agency or commercial telephone, radio, telegraph and power facilities in or adjacent to the area, and degree of use made of such facilities by the Forest Service (actual and probable)
- (b) Broad consideration of the communication problem at both Regional and Forest levels. Such consideration should bring out answers to the following and similar questions:
 - (1) Why is the proposed facility necessary?
 - (2) Where should the facility be located to meet the greatest number of current and anticipated future needs and to permit maximum flexibility and minimum reconstruction and changes in fire control methods, transportation systems, and administrative organization?
 - (3) Is the proposal coordinated with other Forest and Regional plans?
 - (4) Is the proposal coordinated with facilities of other agencies?
 - (5) Is the communication to be provided seasonal or full-time, and how important is it to have uninterrupted service?

- (c) Cost estimates with statements of justification for improvement, revision, or expansion and anticipated maintenance cost, in written form.
- (d) Coordination of inventory data with the requirements set forth in the approved proposal as a basis for developing the plan.
- (e) Regional Communications Committee's review and recommendations to the Regional Forester in steps C. and D.

4. Metallic vs. Ground-Return Construction

Ground-return telephone lines will be standard except where, for justifiable reason, electrical or otherwise, they are not practicable.

Studies, including tests for interference, should be made of each route being considered for ground-return construction. Power companies and cooperatives may have plans to install interference structures near the selected route. Such operators should be consulted for the purpose of determining their plans.

Neither ground nor metallic telephone lines, except distribution lines at Forest Service stations, where power does not exceed 220 volts, should be constructed on the same right-of-way as a power facility. In places where such installations have been made, location of the telephone line will be changed only if required to provide satisfactory service.

5. Integration of Communication Methods

Whenever conditions offer alternative methods of communication a thorough investigation will be undertaken preparatory to initial planning or to the revamping of existing plans. It will be the direct responsibility of field officers to present a thorough analysis of administrative requirements with concise recommendations in accordance with their best judgment. The Region will arrange either through the laboratory or by employing competent personnel with specialized communications training to make the necessary determinations as to technical limitations which may be involved.

If the analysis clearly indicates the advisability of wire service, the possibility of utilizing commercial or other existing facilities should be carefully weighed. Wherever practicable, commercial installations should be used since the cost of such service is often less than the required construction investment and the recurrent cost of maintenance.

The development of specialized radio equipment has reached a point where there can be no reasonable doubt as to its thorough reliability. In this connection, however, it is important to recognize that a wide variety of equipment has been designed to meet specific needs and unless competent selection of equipment is made, erroneous judgment of performance standards may easily result. It is not sound practice to duplicate communication service with two methods as has often been done with wire and radio. The weight of advantage will rest with one or the other which if properly developed will offer maximum reliability. This single method requirement is not intended to discourage the installation of radio at certain telephone equipped stations to provide an extension of communication to further points. Actually the intelligent integration of the two facilities will often be required to obtain essential coverage in a communications network.

6. Construction and Abandonment of Communication Facilities

There shall be no new construction, or abandonment of existing telephone facilities, without first coordinating such action with the communication plan through concurrence of the Forest Supervisor and Regional Communications Committee, subject, of course, to final decision by the Regional Forester.

Additions or removals of instruments, switchboards, and lines shall be reported currently through the Forest Supervisor to the Regional Communications Officer. This procedure is essential to the current maintenance of communication plans and records and to prevent deterioration of a planned system through cumulative loading and eventual loss of satisfactory service.

The only exception to this policy will exist where additions or removals are of a strictly temporary nature and the system is to be restored to original condition upon termination of the emergency.

New installations and relocation of permanent or semi-permanent radio installations shall be reported in a similar manner in order to maintain planned coordination of wire and radio communications.

7. Adherence to Standards

Inspection of communication service and facilities will be made on the basis of the standards and practices set forth in the Telephone and Radio Handbooks. New work and reconstruction should follow these instructions and existing facilities should be gradually brought up to standard during the process of maintenance by adoption of the prescribed practices.

Any communication facility, the retention of which is justified, should be so maintained as to insure adequate and reliable service.

Inspection should include a check for the practice of unauthorized local experimentation and the resulting introduction of non-standard procedures and equipment. Special needs not met by existing equipment or standards should be handled as set forth in the statement on "Centralization of Technical Development".

8. Retaining the Communication Plan Objective

Where the actual construction proposed in communication plans is to be delayed or carried out as several separate jobs extending over a period of years, it is essential that the objectives of the plan be kept in mind during the interim periods.

When the period between planning and execution is prolonged, the tendency exists to lose sight of the plan through accumulation of so-called "emergency construction". In such cases, the plan becomes meaningless before construction is completed, and the planning time and costs are wasted. Adherence to the Regional Committee organization and the current recording of all changes by the Regional Communications Officer, as set forth in "Construction and Abandonment", will help to prevent loss of objective.

9. Authorized use of Radio

There are no administrative restrictions prohibiting the use of very high frequency (30-300 megacycles) (VHF) radio for all-purpose National Forest communications, other than the "non-parallelism" requirements set up in "Integration of Methods of Communication". Since the basic use of radio in the Forest Service is related to fire activities, it is essential that frequencies in the vicinity of 3000 kc (2000 to 4000 kc) be assigned primarily for emergency communications. An established administrative communication network occupying one of these frequencies reduces or nullifies the value of such a frequency for emergency use, not only locally but inter-Forest and frequently inter-Regionally since the channel is apt to be "plugged" by general communications when other units are in urgent need of it for fire or similar emergencies. However, use of these frequencies for other than emergency communication will be authorized providing such use is restricted to those periods of the year when interference (inter-Regionally) of fire communication will not occur, and under conditions where frequencies are so distributed as to insure non-interference with other units,

particularly in adjoining Regions.

10. Lending of Radio Equipment to Other Agencies

Radio equipment may not be lent to other departments or agencies for communication use on frequencies assigned to the Department of Agriculture, since a loan would, in effect, constitute the assignment of a radio-operating frequency to the borrowing agency. Such assignments can be made only by the Federal Communications Commission (FCC) or the Interdepartmental Radio Advisory Committee (IRAC).

In an emergency, the Forest Service may be called upon to furnish valuable service to a public agency by providing radio communication. Under these conditions, radio equipment may be lent for a limited, temporary period, but it should, wherever possible, remain under the immediate supervision of a Forest officer. Loan of equipment should not be made in any instance where Forest Service and other public interests may be jeopardized.

11. Restrictions on Power Output of Transmitters

Power output of Forest Service radio transmitters will not, in any instance, be greater than is necessary to afford reliable and satisfactory communication. Power output shall not exceed the maximum limits specified below, except when specifically authorized by the Chief:

MF (medium frequency	300-3000 KC)	25 watts
HF (high frequency	3000-30000 KC)	25 watts
VHF (very high frequency	30-300 MC)	25 watts

Where special communication problems involving the use of frequencies between 30 and 100 MC can be met only by use of power greater than 25 watts, such problems, together with justification and pertinent technical data, shall be submitted to the Chief for approval and to serve as a basis to obtain authorization to increase power. For point-to-point service on frequencies above 100 megacycles, the power shall be limited to that necessary to obtain reliable communication, but may exceed 25 watts upon specific authorization from the Chief if directional antennas are used and interference is not created with established radio services.

12. Assignment and Use of Radio Frequencies

Radio frequencies assigned to the Department of Agriculture

for use by the Forest Service are necessarily limited in number due to the intensive use of the radio spectrum by the thousands of domestic and international services requiring radio communication. It is imperative, therefore, that the maximum-use value be received from each such assignment and that Service-wide compliance be observed in matters of domestic and international radio regulations.

Maximum-use value can be secured only by over-all coordination of the distribution of frequency assignments to Regions and Forests. This is necessary to prevent inter-Regional frequency conflicts and the development of intolerable interference.

Each Region will prepare and maintain currently a radio frequency inventory and needs proposal, based on a coordinated communication plan, and furnish a copy to the Chief. This material will be consolidated into a general all-service plan and individual Regional requests for assignments will be granted to the extent that all-Service coordination will permit and still retain consistency with the established plan.

Requests for frequency assignments should be specific in listing the location and type (SPF, SX, T, M, etc.) of instruments and the desired frequencies for use at each location. The request should also include a statement covering the general and special uses to be made of the desired frequencies. Portable sets, except those to be used as fixed station, will be reported by Forests only.

13. Centralization of Technical Development

The justification for centralized control of technical developments, generally, has been adequately confirmed. Accordingly, the development, modification, and adaptation of radio equipment will remain in the Radio Laboratory.

Problems involving materials or methods not specifically covered in the Telephone Handbook shall be submitted to the Chief for consideration and final determination. Technical radio problems will be referred to the Radio Laboratory at Portland directly, except where the problem will require travel from the Laboratory, in which case it will be submitted to the Chief.

14. Right-of-way Agreements and Easements

A right-of-way agreement or permit is necessary for all telephone lines not on National Forest land. In some states, it is permissible to use road or highway rights-of-way,

through contact with the proper county or state official. In other states, private property rights extend to the center line of the road or highway right-of-way. Where this condition exists, it is necessary that rights-of-way for the line be secured from landowners and permission to occupy a part of the road right-of-way secured from the state or county officer authorized to issue such permits.

Rights-of-way from private owners should be complete in detail. In most cases the right-of-way should be secured as an easement. The form of acknowledgment should be the same as that commonly used in the applicable state. The legal recording of such instruments is not required, but is considered good business. A sample form acceptable to the Solicitor is included in the appendix.

Rights-of-way over railroad property usually require railroad stipulations, some of which are not acceptable to a Government agency due to statutory restrictions imposed by Congress. A sample form is included in the appendix. This form has the approval of the Solicitor; therefore, any changes which may be necessary to comply with railroad requirements should be reviewed by the Regional Attorney before final execution.

Rights-of-way over public land, administered by another agency, will be handled as an agreement or by an exchange of letters between the proper administrative officials.

Rights-of-way over navigable waterways should be secured from the proper agency, usually the War Department.

15. Location of Lines in Relation to Esthetic Values

Telephone-line construction, in or along areas having esthetic values, should be well planned to avoid destroying or depreciating such values. This will be an objective which should be considered of equal importance with that of constructing the line itself.

Locators of either tree or pole lines can frequently achieve these two common objectives by various devices such as long spans and good engineering. There may be a need, on occasion, to do some supplemental planting to screen out poles and wires. Where this is necessary, it should be accomplished promptly following line construction.

Within roadside zones which have been designed for their scenic value, telephone-line construction should not be permitted without prior approval of the Regional Forester or Chief, as the case may be. Where telephone service is

necessary through or along such zones, the lines should be well removed and screened from the road. Frequently commercial wires are available, in which case either circuit or pin space should be rented. The scenic values of such zones are often spotty and of short length, and complete removal of the facilities from within sight of the road need be effected only through the actual scenic areas of such zones.

In order to avoid failures common to underground construction, telephone lines at Ranger and other Forest Service stations should be kept overhead wherever possible. Esthetic values can often be preserved by bringing the lines through a carefully selected location, usually in the rear of the building or buildings. Landscaping will, in many instances, successfully screen out the construction.

In primitive or natural areas, radio should ordinarily be used in lieu of the telephone. Where that is not practicable, tree-line construction should be used and right-of-way clearing held to a minimum.

16. Charges for Facilities Use

Permission will not be granted by the Forest Service to individuals, groups, companies, or agencies, to attach wire, crossarms, brackets, or any facility, to Forest Service poles without approval by the Regional Forester. His consideration should be based upon adequate data, taken from the communication plan, correlated with the indicated needs of the Forest Service. He should also consider state laws covering telephone-line construction, the purpose for which the request is made, and the benefits and disadvantages which may accrue to Forest Service facilities and needs if the permit is granted. The maintenance plan of the facility, and the financial integrity of those responsible for compliance with the plans, should also be given consideration. These requirements are made to assure the Forest Service of the continued and unimpaired use of its facilities.

Cooperation involving joint ownership, construction, or maintenance of telephone lines introduces a division of responsibility which may affect communication and maintenance as well as future growth and extensions. Such cooperation will not be entered into except in unusual instances, and then only with the specific approval of the Regional Forester.

Except where National or Regional contracts apply, Forest Service contacts on commercial or privately owned telephone poles will be paid for at the stated tariff rate of the company or individual, unless local conditions require special treatment.

Company or individual contacts on Forest Service poles will be paid for at rates in accordance with current National or Regional contracts, reciprocal rates, or at the regular tariff rates of the commercial company operating in the territory.

17. Commercial Use of National Forests Affecting Communication

Special-use permits for commercial or other-agency radio transmitter station, testing station, and experimental laboratory sites, and applications for communication or power-line rights-of-way where such permits are regularly handled by the Forest Service, shall be reviewed by the Communications Committees for determination of possible effects on existing and proposed Forest Service communication facilities prior to issuance of such permits. Non-interference clauses should be uniformly included as added protection of Forest Service networks.

18. Cooperation in Communications with State and Private Forestry and Federal Protection Agencies

The communications work of State and Private Forestry and Federal forest protection agencies ties into the work of the Forest Service through the common purpose of forest protection programs and conservation in general.

Where well-established state forestry communication systems do not exist but are needed, the Forest Service should offer guidance and assistance in developing planned systems, including technical advice and arrangements for the necessary frequencies. By so doing, a more workable coordination of the facilities of the two agencies can be secured and intercommunication, both wire and radio, can be developed as needed.

Similarly, a common purpose can frequently be accomplished through development of a coordinated communication system by the Forest Service and other Federal land management agencies such as the Park Service, Indian Service, and Grazing Service. The needs of the Forest Service should be carefully studied in working out such arrangements.

